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Lands
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24th March 2022

‘Northern Territory Infrastructure Framework Position Paper’ Submission

1. Introduction

The Arid Lands Environment Centre (ALEC) is Central Australia's peak environmental organisation. Since 1980, ALEC has advocated for the protection of nature and the sustainable management of the Northern Territory's diverse and unique landscapes. We actively contribute to the development of infrastructure policy through regulatory reform, written submissions on infrastructure projects, community education and advocacy.

ALEC welcomes the opportunity to provide comment on the *Northern Territory Infrastructure Framework Position Paper* (Infrastructure Framework). Infrastructure is key to supporting healthy environments, communities and economies. A strategic approach is vital to ensure planning is comprehensive, appropriate and sustainable.

ALEC's submission focuses on climate-related risk. Climate change must be central to infrastructure planning in the Northern Territory. While positive steps have been taken in developing a position paper, the risks climate change poses has not been given substantive weight. We also make comment that the role of gas is overemphasised in the proposed Infrastructure Framework.

2. Climate change and infrastructure planning

As the Minister for Infrastructure, Eva Lawler has stated 'if we don't do anything [about climate change], the NT will become unlivable'¹. It is not an exaggeration to state that climate change presents an existential threat to the Northern Territory. The risks posed by climate change are real and pose a severe risk for current and future infrastructure.

Some of the risks posed by climate change upon infrastructure includes²:

- Changes in demand for infrastructure services (e.g. electricity, water, migration).

¹ Allam, L, Evershed, N, Bowers, M, 2019. 'Too hot for humans: First Nations people fear becoming Australia's first climate refugees'. The Guardian.

² Organisation for Economic Co-operation and Development, 2018, p.10-11. 'Climate-resilient infrastructure: policy perspectives. OECD Environment Policy Paper No.14'.

- Changes in the capacity for that infrastructure service to be provided (e.g. increased cost to production, risk of becoming a stranded asset, physical damage as a result of climatic events, disruption to the supply chain, reputational damage).

The risks of climate-related impacts to essential infrastructure should be well understood, with the flooding events in South Australia in early 2022 creating supply chain chaos for the Northern Territory. It resulted in major disruptions to the Stuart Highway for weeks and the closure of the railway line connecting Darwin and Alice Springs with Adelaide for over three weeks³. These scenarios should become case studies for the Northern Territory's future infrastructure planning. Weaknesses in the infrastructure system should be identified and opportunities to strengthen the network should be promoted. Infrastructure planning must do more than just pick individual winners.

Climate risks should be at the forefront of infrastructure planning. Embedding climate change risk into infrastructure planning can: de-risk development; build resilience into the infrastructure network; ensure that development is place-based and appropriate; and, limit the opportunity for stranded assets to be developed. This emphasis on climate change compliments the cross cutting objectives of the Infrastructure Framework to: 'invest in the right infrastructure, in the right place, at the right time'; 'improve liveability'; and, 'embed sustainability and resilience'⁴. It is imperative that climate change impacts form a major part of the infrastructure framework. With recognition and understanding of climate impacts (see section 2a and 2b), opportunities emerge to understand risk and promote effective measures to adapt and build climate-resilient infrastructure (section 2c, 2d and 2e).

It is important to also note that infrastructure globally accounts for 79% of all greenhouse gas emissions, and that infrastructure accounts for 88% of all adaptation costs⁵. In addition, it is understood that 54% of all future climate adaptation costs will be related to water infrastructure⁶.

a. Climate Change impacts in the Northern Territory

While this information is high-level and hopefully well-known and understood, due to the severe risk posed by climate change climate impacts we consider it appropriate for the impacts upon the Northern Territory to be re-emphasised.

The Territory is already a place of climate extremes, and climate change is increasing the intensity, frequency and variability of climatic events⁷. In Central Australia this means hotter temperatures (*Figure 1*), more intense heat events, longer periods in drought, more intense rainfall events, more erratic rainfall and aquifer recharge (*Figure 2*), increasing the likelihood of major flood events (noting that Alice Springs is built on a flood plain), drier soils, increased evapotranspiration, more wildfires and increased risk of erosion⁸. The realities of climate change are stark with its impacts cascading and

³ Rikard-Bell, H, 2022. 'Vital rail link between SA, the NT and WA reopens 25 days after floods'. ABC.

⁴ Northern Territory Government, 2022, p.11. 'Northern Territory Infrastructure Framework Position Paper'

⁵ Thacker, S, Adshead, D, Fantini, C, Palmer, R, Ghosal, R, Adeoti, T, Morgan, G, Stratton-Short, S. 2021, p.5. 'Infrastructure for climate action'. UNOPS, Copenhagen, Denmark.

⁶ Ibid.

⁷ Intergovernmental Panel on Climate Change, 2022. 'Chapter 11: Australasia'. IPCC WGII Sixth Assessment Report: Full report.

⁸ CSIRO. 2020. 'Climate change in the Northern Territory: State of the science and climate change impacts'.

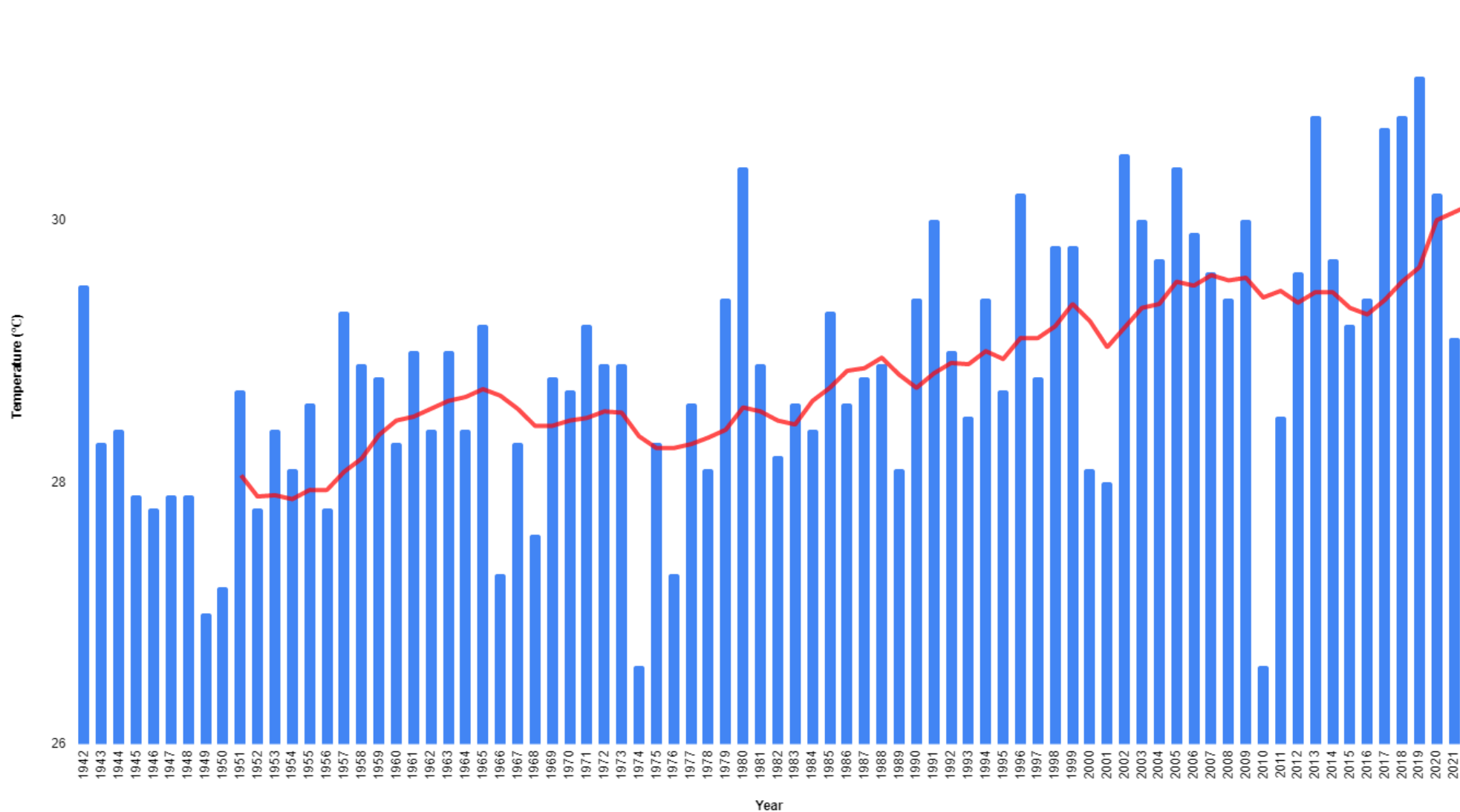


Figure 1. Alice Springs annual maximum temperature (°C) between 1942-2021 with a 10-year moving average trendline. Data: BOM

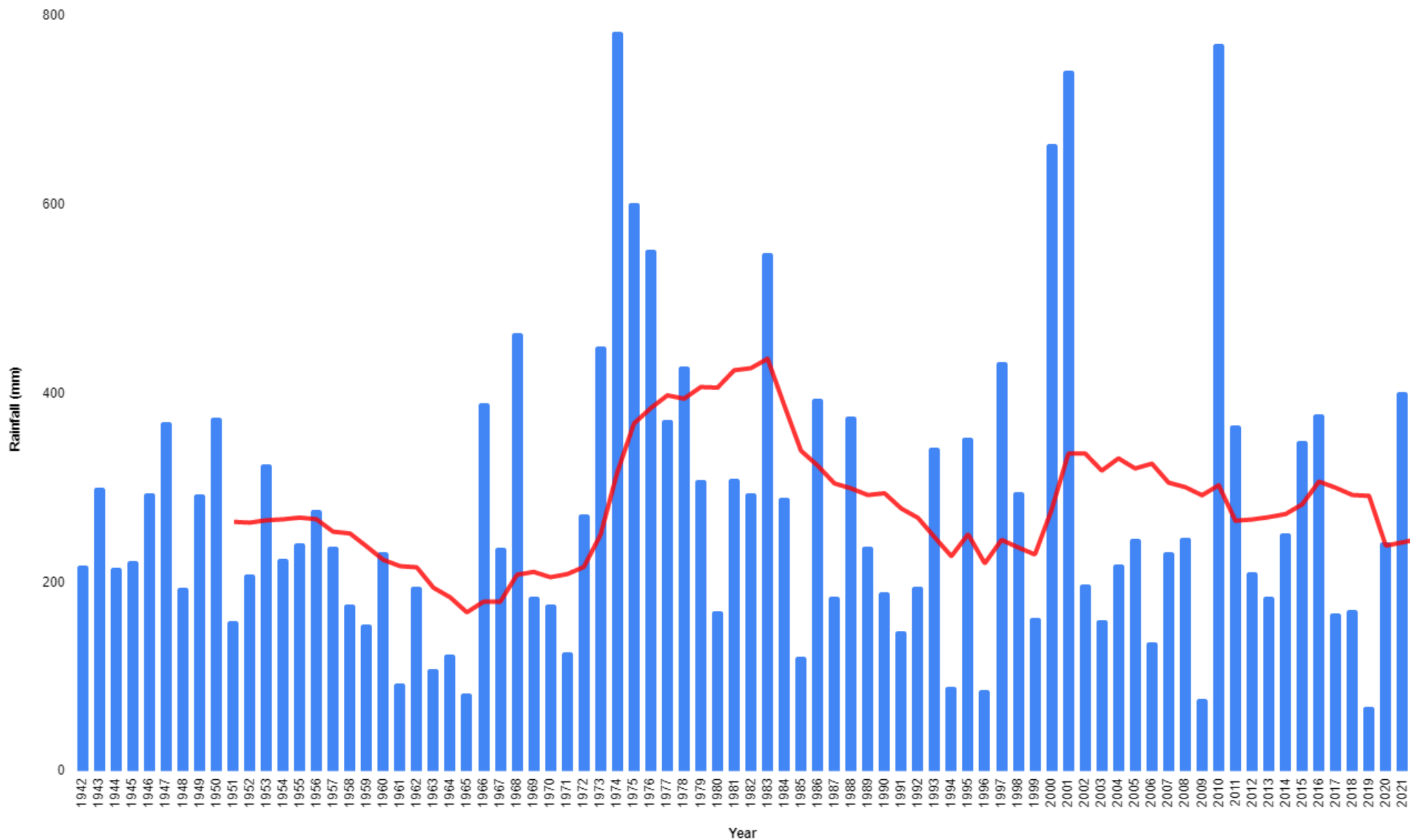


Figure 2. Alice Springs annual rainfall in millimetres between 1942-2021 with a 10-year moving average trendline. Median rainfall across the historical record is 237.9mm. Data: BOM

compounding⁹. Climate change will increase the stress on existing and new infrastructure, from roads, pipelines and power stations, to housing, telecommunications, transport and water assets¹⁰.

In January 2019, the average daily maximum temperature in Alice Springs was 41.5°C, 5°C above the average maximum temperature for January¹¹. Under a high emissions scenario, by the end of the century we can expect every second day in Alice Springs to be above 35 degrees, nearly double the historical average¹². Tennant Creek and Elliott will see close to an extra 100 days above 35°C across the same period¹³. In Alice Springs between 1989-2018, there were six-times more days above 44°C than between 1959-1988¹⁴. Tennant Creek across the same period has experienced 7 days a year above 44°C compared to zero in the 30 years prior¹⁵. Alice Springs has warmed by 2°C comparing the annual maximum temperatures between 1942-1951 and 2012-2021¹⁶ (*Figure 1*) and similar trends can be found across Central Australia. An increased variability and intensity in rainfall has been observed in Alice Springs (*Figure 2*), with a median rainfall of 237.9mm recorded across the historical record.

Climate change also further threatens already at-risk ecosystems. It is understood that arid and semi arid environments are undergoing collapse, (as are savannah and mangrove environments in the Top-End)¹⁷. This is due to temperature and precipitation changes, habitat change and loss, invasive species such as buffel grass, livestock, agriculture and water extraction¹⁸. Collapse is understood as an ecosystem which has undergone as ‘a change from a baseline state beyond the point where an ecosystem has lost key defining features and functions and is characterised by declining spatial extent, increased environmental degradation, decreases in, or loss of, key species, disruption of biotic processes, and ultimately loss of ecosystem services and functions’¹⁹. It is important to consider how the state of the Northern Territory’s environment impacts future infrastructure planning.

As detailed above, increased temperatures, more heatwaves and longer time spent in drought, combined with more erratic and variable rainfall result in a high likelihood that ‘fire weather will become more frequent and harsher’ in the Northern Territory²⁰. The *Climate change in the Northern Territory: State of the Science and climate change impacts report* goes further stating that:

‘in the southern and central parts of the Territory changes to fire frequency depend on rainfall changes. With higher temperatures and lower rainfall, climate change will result in a

⁹ Intergovernmental Panel on Climate Change, 2022, p.3. ‘Chapter 11: Australasia’. IPCC WGII Sixth Assessment Report: Full report.

¹⁰ Organisation for Economic Co-operation and Development, 2018, p.12. ‘Climate-resilient infrastructure: policy perspectives. OECD Environment Policy Paper No.14’.

¹¹ Bureau of Meteorology. 2021. ‘Climate data online: Monthly mean maximum temperature: Alice Springs Airport’. Accessed March 2022.

¹² CSIRO. 2020, p.14. ‘Climate change in the Northern Territory: State of the science and climate change impacts’.

¹³ Ibid.

¹⁴ Ibid.

¹⁵ Ibid

¹⁶ Bureau of Meteorology. 2021. ‘Climate data online: Monthly mean maximum temperature: Alice Springs Airport’. Accessed March 2022.

¹⁷ Bergstrom, D, Wienecke, B, van den Hoff, J, Hughes, L, Lindenmayer, D, Ainsworth, T, Baker, C, Bland, L, Bowman, D, Brooks, S, and Canadell, J. 2021. Combating ecosystem collapse from the tropics to the Antarctic. *Global change biology*, 27(9), pp.1692-1703.

¹⁸ Ibid, p.1694.

¹⁹ Ibid, p.1693.

²⁰ CSIRO. 2020, p.21. ‘Climate change in the Northern Territory: State of the science and climate change impacts’.

harsher fire-weather climate in the future; that is, when bushfires occur, more extreme fire behaviour can be expected'²¹.

Wildfires place the Northern Territory's unique, diverse and threatened environments at risk, while infrastructure that supports tourism, land management and remote communities will also be under threat (e.g. 2021 wildfires at Watarrka, 2018-19 wildfires in the West MacDonnell Ranges).

b. Intergovernmental Panel on Climate Change report *Climate Change 2022: Impacts, Adaptation and Vulnerability*

New and updated scientific reporting by the Intergovernmental Panel on Climate Change (IPCC) serves as a stark reminder of the climatic trends impacting Australia. This new report also highlights the impacts climate change poses to physical and social infrastructure. It emphasises the need to embolden investment in climate adaptation infrastructure, which presents a substantial opportunity for governments in responding to the impacts of climate change. It makes clear that delay in investment in climate adaptation infrastructure will result in greater costs incurred in the future. The Report's focus on vulnerability is particularly relevant for the Northern Territory compared to other jurisdictions. The report states that²²:

1. 'Ongoing climate trends have exacerbated many extreme events (very high confidence)';
2. 'Climate trends and extreme events have combined with exposure and vulnerabilities to cause major impacts for many natural systems, with some experiencing or at risk of irreversible change in Australia (very high confidence)';
3. 'Climate trends and extreme events have combined with exposure and vulnerabilities to cause major impacts for some human systems (high confidence)';
4. 'Climate impacts are cascading and compounding across sectors and socio-economic and natural systems (high confidence). Complex connections are generating new types of risks, exacerbating existing stressors and constraining adaptation options';
5. 'Increasing climate risks are projected to exacerbate existing vulnerabilities and social inequalities and inequities (high confidence)';
6. 'Further climate change is inevitable, with the rate and magnitude largely dependent on the emission pathway (very high confidence)';
7. 'Climate risks are projected to increase for a wide range of systems, sectors and communities, which are exacerbated by underlying vulnerabilities and exposures (high confidence)';
8. 'There are important interactions between mitigation and adaptation policies and their implementation (high confidence)'.

These challenges and solutions have been identified:

9. 'The ambition, scope and progress of the adaptation process has increased across governments, non government organisations, businesses and communities (high confidence)';
10. 'Adaptation progress is uneven, due to gaps, barriers and limits to adaptation, and adaptive capacity deficits (very high confidence)';

²¹ Ibid.

²² Intergovernmental Panel on Climate Change, 2022, p.3-6. 'Chapter 11: Australasia'. IPCC WGII Sixth Assessment Report.

11. 'A range of incremental and transformative adaptation options and pathways is available as long as enablers are in place to implement them (high confidence)';
12. 'New knowledge on system complexity, managing uncertainty and how to shift from reactive to adaptive implementation is critical for accelerating adaptation (high confidence)';
13. 'Aboriginal and Torres Strait Islander Peoples and Tangata Whenua Māori can enhance effective adaptation through the passing down of knowledge about climate change planning that promotes collective action and mutual support across the region (high confidence)';
14. 'A step change in adaptation is needed to match the rising risks and to support climate resilient development (very high confidence)';
15. 'Delay in implementing adaptation and emission reductions will impede climate resilient development, resulting in more costly climate impacts and greater scale of adjustments (very high confidence)'

c. Understanding risk and its connection to climate change

The IPCC is clear on the role of risk in mitigating and adapting to climate change²³:

Risk provides a framework for understanding the increasingly severe, interconnected and often irreversible impacts of climate change on ecosystems, biodiversity, and human systems; differing impacts across regions, sectors and communities; and how to best reduce adverse consequences for current and future generations. In the context of climate change, risk can arise from the dynamic interactions among climate-related hazards, the exposure and vulnerability of affected human and ecological systems. The risk that can be introduced by human responses to climate change is a new aspect considered in the risk concept.

Recognising the risks of climate change and understanding vulnerability and exposure leads to a basis where impacts upon infrastructure can be mitigated, adaptation measures applied and resilience constructed.

Key terms in this space are vulnerability, adaptation, resilience, risk and exposure. In the Infrastructure Framework in relation to infrastructure planning, we note that vulnerability and exposure are not referred to once and that risk and adaptation are referred to minimally. Resilience and resilient are used 18 times (the most used term of the five by far), but are never defined, instead they are used in a general and vague manner appearing more as a buzzword e.g. 'Planning for sustainable and resilient regions...'²⁴. These five terms should be central to infrastructure planning. As a comparison, the word 'economic' is referred to 130 times and 'economy' a further 48 times. Understanding risk, vulnerability, adaptation, resilience and exposure are key to ensuring that infrastructure planning results in positive economic outcomes. It also increases the likelihood that the infrastructure developments are appropriate and result in long-term benefit. The lack of focus on these values is a major oversight in the Infrastructure Framework.

²³ Ibid

²⁴ Northern Territory Government, 2022, p.21. 'Northern Territory Infrastructure Framework Position Paper'

Key terms: vulnerability, adaptation, resilience, risk and exposure²⁵.

Vulnerability is defined ‘as the propensity or predisposition to be adversely affected and encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt’.

Adaptation is defined as ‘in human systems, as the process of adjustment to actual or expected climate and its effects in order to moderate harm or take advantage of beneficial opportunities. In natural systems, adaptation is the process of adjustment to actual climate and its effects; human intervention may facilitate this’.

Resilience is defined as ‘the capacity of social, economic and ecosystems to cope with a hazardous event or trend or disturbance, responding or reorganising in ways that maintain their essential function, identity and structure as well as biodiversity in case of ecosystems while also maintaining the capacity for adaptation, learning and transformation. Resilience is a positive attribute when it maintains such a capacity for adaptation, learning, and/or transformation’.

Risk is defined as the ‘potential for adverse consequences for human or ecological systems, recognising the diversity of values and objectives associated with such systems’.

Exposure is defined as the ‘presence of people; livelihoods; species or ecosystems; environmental functions, services and resources; infrastructure; or economic, social or cultural assets in places and settings that could be adversely affected’.

d. Embedding climate risk into the Northern Territory Infrastructure Audit

While ALEC welcomes the intent of the following statement it does not go far enough. The Infrastructure Framework states that the Northern Territory Infrastructure Audit will:

‘provide a longer-term (2050) understanding of the infrastructure requirements to meet global and national emerging trends such as a net zero emissions future, and consideration of the impacts of climate change risks and opportunities such as the take up of electric vehicles’²⁶

This sentiment is reiterated when discussing the ‘cross cutting strategic theme’ for the Northern Territory Government that one of them is:

‘decarbonisation, enabling an affordable transition to a net-zero future, making climate change risk and opportunity a consideration in all infrastructure assessment, planning and decision making processes’²⁷.

While the intent of the statement is welcome, it does not provide a clear pathway of what will actually happen as a result of such ‘consideration’. The Infrastructure Audit must go further than ensuring that climate risks are only ‘considered’ as there is limited accountability associated with this term. The Infrastructure Framework should demonstrate how climate change risks are considered and then create corresponding policy requirements around climate-related risk and infrastructure planning.

²⁵ Intergovernmental Panel on Climate Change, 2022, p.4-5. ‘Climate Change 2022: Impacts, Adaptation and Vulnerability. Summary for Policymakers’.

²⁶ Northern Territory Government, 2022, p.12. ‘Northern Territory Infrastructure Framework Position Paper’

²⁷ Ibid, p.31.

Climate risks should be central to decision-making and the granting of approvals. The Northern Territory Infrastructure Audit must identify the risks climate change poses to physical and social infrastructure across the six regions of the Northern Territory. These risks should be identified through qualitative and quantitative analysis. Then, once they have been identified, a pathway should be outlined for how climate risks should inform infrastructure planning across the Northern Territory. As outlined in the cross cutting objectives, this will build resilience into the infrastructure network, ensure that infrastructure is place-based and appropriate and will see infrastructure that improves livability prioritised. Every development should be required to complete a climate risk matrix. Furthermore, corporations in the Northern Territory should be required to disclose climate-related financial information which includes risks and opportunities (this has recently been mandated in the United Kingdom)²⁸.

Recommendation 1: Identify and develop a pathway for how climate change risk, exposure, resilience, adaptation and vulnerability are integrated into the Infrastructure Framework.

Recommendation 2: Identify climate risks for existing and future infrastructure in and between each of the Northern Territory's six regions (Greater Darwin, Top End, East Arnhem, Big Rivers, Barkly and Central Australia).

Recommendation 3: Commit to developing a climate risk matrix as part of the Infrastructure Framework.

Recommendation 4: Require corporations to disclose climate-related risks and opportunities for all infrastructural developments.

e. Building climate-resilient infrastructure

Climate-resilient infrastructure is:

‘planned, designed, built and operated in a way that anticipates, prepares for, and adapts to changing climate conditions. It can also withstand, respond to, and recover rapidly from disruptions caused by these climate conditions. Ensuring climate resilience is a continual process through the life of the asset. Efforts to achieve climate resilience can be mutually reinforcing with efforts to increase resilience to natural hazards. Climate-resilient infrastructure reduces, but may not fully eliminate, the risk of climate-related disruptions. The extent to which climate change translates into risks for infrastructure depends upon the interaction of changing climate hazards with exposure (the location of assets) and vulnerability... The climate resilience of individual infrastructure assets should be viewed in the context of the system as a whole. Considering climate impacts for individual assets, such as a bridge or a railway line, is necessary but not sufficient to ensure that the system functions reliably despite a changing climate. For this reason, efforts to ensure resilience at the project level should be embedded within a strategic approach to infrastructure network

²⁸ See ‘Task Force on Climate-Related Financial Disclosures’ for further information.

planning that accounts for the direct and indirect effects of climate change and climate variability.²⁹

There is a significant opportunity for benefits in developing a strategic and coordinated approach to infrastructure planning in a changing climate, so that:

- 'infrastructure can have an essential role in strategies to manage the risks and minimise the negative impacts of climate change'³⁰;
- Climate-resilient infrastructure can help the Territory achieve its commitment to reach net-zero emissions by 2050;
- 'Climate-resilient infrastructure has the potential to improve the reliability of service provision, increase asset life and protect asset returns'³¹;
- Increased efficiency of service provision;
- 'Ecosystem-based approaches, including natural infrastructure, can provide an effective complement or substitute for traditional built (or "grey") infrastructure'³².

Through prioritisation of climate-resilient infrastructure, the Northern Territory's infrastructure framework can become more robust, sustainable and resilient, by reducing risk and building a coordinated network of infrastructure within the Northern Territory's six regions and across the Territory wide system.

Recommendation 5: Define what is climate-resilient infrastructure in the Infrastructure Framework.

Recommendation 6: Clarify and strengthen the enabling environment for the development of climate-resilient infrastructure within the Infrastructure Framework.

3. The role of gas has been overemphasised in the Infrastructure Framework

ALEC is disappointed at the over-inflated role gas is positioned to have in the Infrastructure Framework. The Infrastructure Framework suggests that gas is one of the largest industries in the Northern Territory, it states 'Figure 8 below highlights the value of mining (minerals and gas) as the largest industry in the Territory contributing about 25 per cent of total GSP in 2020-21'³³. Gas extraction is not a form of mining and it is not part of the \$6.4 billion mining figure as outlined in 'Figure 8 - Northern Territory Industry contribution to output, and growth in, GSP and employment 2020-21'. Instead gas is found within 'electricity, gas and water services' which collectively contribute \$0.57 billion (or less than 2%) to Territory's GSP.

This is seriously misleading as a gas-fired recovery isn't going to create a jobs boom or be a major contributor to Territory GSP. In fact, the oil and gas industry is one of the least labour intensive industries in Australia. The gas industry currently employs 17000 workers, which is less than 0.2% of the Australian workforce despite Australia's position as one of the world's largest gas exporters³⁴.

²⁹ Organisation for Economic Co-operation and Development, 2018, p.4. 'Climate-resilient infrastructure: policy perspectives. OECD Environment Policy Paper No.14'.

³⁰ Ibid, p.8

³¹ Ibid.

³² Ibid.

³³ Northern Territory Government, 2022, p.18. 'Northern Territory Infrastructure Framework Position Paper'

³⁴ ABS, 2020. 81550DO002_201718 Australian Industry, 2019-20.

Nearly twice as many people work at Bunnings than they do in the oil and gas industry. For every \$1 million in sales generated, only 0.4 jobs are created in the gas industry.³⁵ Gas jobs are increasingly automated, with the remaining jobs often highly skilled. It is likely that the workforce in the Northern Territory will be dependent on fly-in, fly-out workers. This may result in limited benefit for the Territory in terms of employment opportunities. In addition, Fleming and Measham found that job spill over into non-mining employment following Queensland coal seam gas (CSG) development was 'negligible'³⁶. Retail and manufacturing showed minimal growth whilst other local services jobs and agricultural employment declined. Overall, 9 jobs were lost in the services sector for every 10 new CSG jobs. It remains unclear whether an onshore gas industry is viable in the Territory, or whether it will result in Territory benefit.

In addition, it is important to note that Infrastructure NT works closely with the 'Chairman of the Gas Taskforce to identify the enabling infrastructure required to support private sector investment'³⁷. No similar level of representation or prioritisation has been given to other key emerging sectors such as those around solar, green manufacturing and hydrogen. This is despite these sectors having the potential to create more jobs, received a similar or greater focus in 2020 submissions, have long-term potential, have far less risk of becoming a stranded asset and are in alignment with the Northern Territory's commitment to reach net-zero emissions by 2050³⁸. Nor does there seem to be the same opportunity for input from key sectors in the Northern Territory around infrastructure planning, such as unions, Aboriginal-controlled organisations, community and social services and environment.

A just transition is an opportunity to reconstruct the Northern Territory's physical and social infrastructure, yet it has received limited attention in this position paper.

4. Conclusion

There is huge potential in developing a coordinated infrastructure framework for the Northern Territory. Infrastructure planning is key and the importance of this document should not be understated. However, it is a major oversight to have a limited focus on the interaction between climate change, risk and infrastructure planning. Beyond gesture, this Infrastructure Framework does not place any significance or provide any kind of pathway for how climate-related risks will inform the infrastructure framework and future infrastructure planning. The Northern Territory is prone to extreme weather events, and climate change will increase the intensity and frequency of many of these events. Through integrating climate risk across infrastructure planning, it can build resilience across the system, reduce exposure and cost, and adaptation opportunities can be identified which can then support a reduction in vulnerability. Within the Infrastructure Framework, ALEC sees substantial opportunity in the Infrastructure Audit to prioritise climate risks across the Northern Territory.

³⁵ ABS, 2020. 81550DO002_201718 Australian Industry, 2019-20.

³⁶ Fleming, D, & Measham, T, 2015. Local economic impacts of an unconventional energy boom: the coal seam gas industry in Australia. *Australian Journal of Agricultural and Resource Economics*, 59(1), pp.78-94.

³⁷ Northern Territory Government, 2022, p.6. 'Northern Territory Infrastructure Framework Position Paper'

³⁸ Northern Territory Government, 2022, p.38. 'Northern Territory Infrastructure Framework Position Paper'

Infrastructure is not separate from the environment and the impacts of climate change. It is essential that the Northern Territory build an infrastructural system that adopts climate-resilient infrastructure. It is 2022, climate risks must be understood and their impacts integrated into all infrastructure planning.

Kind Regards,

A handwritten signature in black ink, appearing to read 'A. Vaughan'.

Alexander Vaughan
Policy Officer