Australian Forestry

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/tfor20

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To cite this article: W. Jackson, M. Freeman, B. Freeman & H. Parry-Husbands (2021) Reshaping forest management in Australia to provide nature-based solutions to global challenges, Australian Forestry, 84:2, 50-58, DOI: 10.1080/00049158.2021.1894383

To link to this article: https://doi.org/10.1080/00049158.2021.1894383

AUSTRALIAN FORESTRY
2021, VOL. 84, NO. 2, 50–58
https://doi.org/10.1080/00049158.2021.1894383

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Reshaping forest management in Australia to provide nature-based solutions to global challenges

W. Jackson [a], M. Freeman [b], B. Freeman [c] and H. Parry-Husbands [d]

[a]Director, Intellagama Pty Ltd, Australia; [b]Principal Consultant, Hollow-wood Enterprises Pty Ltd, Toorak, Australia; [c]Head of Strategy and Sustainability, Indufor Asia Pacific, Melbourne, Australia; [d]Pollinate, Surry Hills, Australia

ABSTRACT

It is time to move beyond the era of conflict and develop a new shared vision for the management of Australia's public forests. We need more holistic approaches that encompass all forest values across the landscape, rather than the current approach of dividing public forest management up across different government agencies. More collaborative approaches will be required to galvanise the resources, skills and knowledge that enables this shift in shared governance. Recent bushfires in Australia have heightened concerns that the management of public forest lands has largely failed to ensure the health of forest ecosystems, build resilience, and secure a promised balance between economic, social and environmental values. Investment in efforts to adapt forest management to address climate change has been limited; and empowering and increasing the role of Indigenous Australians in forest management could be significantly improved. Furthermore, the COVID-19 pandemic has highlighted the need to improve the resilience of regional communities to major shocks and stresses caused by factors that encompass market dynamics, supply-chain disruptions and natural disasters. Three key strategies are proposed to strengthen forest management in Australia: first, establishing new shared governance models that bring together government agencies with Indigenous Australians and actors from the private sector and civil society; second, extending active and adaptive management across forest landscapes that builds resilience in our forests, local communities and society; and third, integrating traditional knowledge with scientific evidence and innovative technologies to enhance forest management for improved resilience and other outcomes.

ARTICLE HISTORY
Received 17 November 2020
Accepted 15 February 2021

KEYWORDS
forest policy; climate change; nature-based solution; adaptive management; circular economy

Introduction

There is a need for new approaches to forest management in Australia. Forests play critical roles in conserving biodiversity, storing carbon and providing a wide range of environmental, social and economic benefits to society. However, internationally and in Australia, there are concerns about forest ecosystem health (MPIGA & NFISC 2018; WWF 2020). Land clearing, bushfires, invasive species, climate change and the interaction between these factors present ongoing and serious challenges to forest values (Jackson et al. 2017). Despite what is arguably an increasingly stringent regulatory environment and the ongoing expansion of the conservation reserve system, indicators of forest-dwelling and forest-dependent[1] threatened species and the condition and extent of some forest habitats continue to decline (MPIGA & NFISC 2018).

Amid these concerns, a body of opinion and media coverage often presents timber harvesting as a primary threat to forest ecosystems and suggests that ceasing timber harvesting will protect threatened species and habitats and reduce the risk of severe bushfires (Lindenmayer et al. 2020). Yet the situation is far more complex. Major threats to forest cover and forest ecosystems are a result of a historical legacy of extensive clearing of forests, as well as ongoing impacts of urban expansion, feral cats and other invasive species, changes to the frequency and intensity of fires, and climate change (Woinarski et al. 2015; Jackson et al. 2017; Wintle et al. 2019).

The 1992 National Forest Policy Statement (Commonwealth of Australia 1992a) sets out a vision for the ecologically sustainable management of Australia's forests. The policy aims to deliver the full range of benefits that forests can provide now and in the future. Regional forest agreements (RFAs) provide the planning framework for implementing the goals of this policy statement in those regions in which natural forest wood production is important (Davey 2018). RFAs were developed to be 'long-term bilateral agreements that *strike a balance between the environmental, social, and economic uses of forests*' (emphasis added; DAWR 2019). However, it is apparent that this policy planning framework has not provided an effective or enduring mechanism for presenting and addressing trade-offs between values or for engaging the broader public in managing those trade-offs and providing assurance that different values are being properly considered.

Consequently, the priorities for managing public forests have swung over time between timber production and conservation, depending on political interests, rather than managing for all values and balancing environmental, social and economic goals. Jacobsen et al. (2020) reports an increase in the reserve system during the 20-year period of RFAs, with a corresponding decrease in areas available for harvesting wood products and sustainable yields of sawlogs on public land in these regions. Yet funding and resourcing for national parks have not evolved commensurate with the increases in area reserved, and economic activity from timber harvesting and the numbers of skilled forest workers have declined.

Forests have become political battlefields, and there appears to have been limited success in generating community

CONTACT W. Jackson william.jackson@intellagama.com Intellagama Pty Ltd, Sapphire Beach, Australia

[1]Forest-dwelling species are species that *may* use forest habitat for all or part of their lifecycles; forest-dependent species are species that *must* inhabit a forest habitat for all or part of their lifecycles (MPIGA & NFISC 2018).

agreement on the right approach to managing public forests. This situation is being exacerbated by the stresses imposed by large-scale bushfires and invasive species. Furthermore, there is limited evidence that changes in forest management are adequately addressing climate change or incorporating the interests, perspectives and traditional practices of Indigenous Australians and the changing views of society (Jackson 2019).

Improving the management of Australia's public land forests is constrained by community conflict, adverse media coverage, misinformed public debate, and stakeholder relations tarnished with acrimony.[2] As in other arenas of Australian public life, a focus on short-term political advantage has seen the promotion of simplistic solutions to complex problems. These solutions are not achieving conservation goals across the landscape, but they are generating considerable uncertainty for forest-based industries. There is little evidence that the situation will improve without a substantial change of approach (Kanowski 2017; Jackson 2019; Keenan 2019).

However, the 2019/20 Black Summer bushfires (Davey & Sarre 2020), closely followed by the COVID-19 pandemic, should provide the impetus to 'build back better' (OECD 2020); specifically, it should lead to changes in forest management to improve conservation measures, enhance forest resilience, and strengthen the capacity of regional communities and those in the wider economy to manage challenges in the future.

A holistic approach

New approaches are now needed to address these forest management challenges in Australia. We need more holistic approaches that encompass all forest values across the landscape, rather than the current approach of dividing up forest management across different government agencies and designated land management authorities.

We also need to ensure that forests are managed to enhance their resilience and enable them to recover from disturbance impacts and threats created by climate change and other factors. Forest resilience is vitally important for ecosystem health.

Increasing the resilience of forest ecosystems will help conserve biodiversity and sustain a broad range of ecological values. It will also support the development of sustainable livelihoods for regional communities. This view is underpinned by the paradigm that safeguarding human health, wealth and security is intrinsically linked to safeguarding environmental health (WWF 2020).

In this way, contemporary approaches to forest management will provide nature-based solutions to current challenges such as adapting to climate change and economic recovery from the COVID-19 pandemic. The International Union for Conservation of Nature (IUCN) describes nature-based solutions as:

> 'actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits' (IUCN 2020).

A more holistic and integrated approach to achieving the ecologically sustainable management of Australia's public land forests can provide a nature-based solution with the following outcomes (Figure 1):

- Resilient and healthy forests that enable communities to deal with climate change, bushfires, and other threats.
- Management of forest lands for all forest values, including the culture, knowledge, values and rights of Aboriginal and Torres Strait Islander peoples.
- Forest land management that supports a more circular, robust low-emissions economy to enable sustainable development and actively address climate change by using renewable resources, reducing waste, and recycling products through sustainable production systems with relatively low emissions-intensity profiles.

New forest management strategies

We suggest that desired outcomes for forests can be achieved by implementing three interlinked strategies (Figure 1), discussed in turn below:

(1) establishing and applying new shared governance models that bring together government agencies

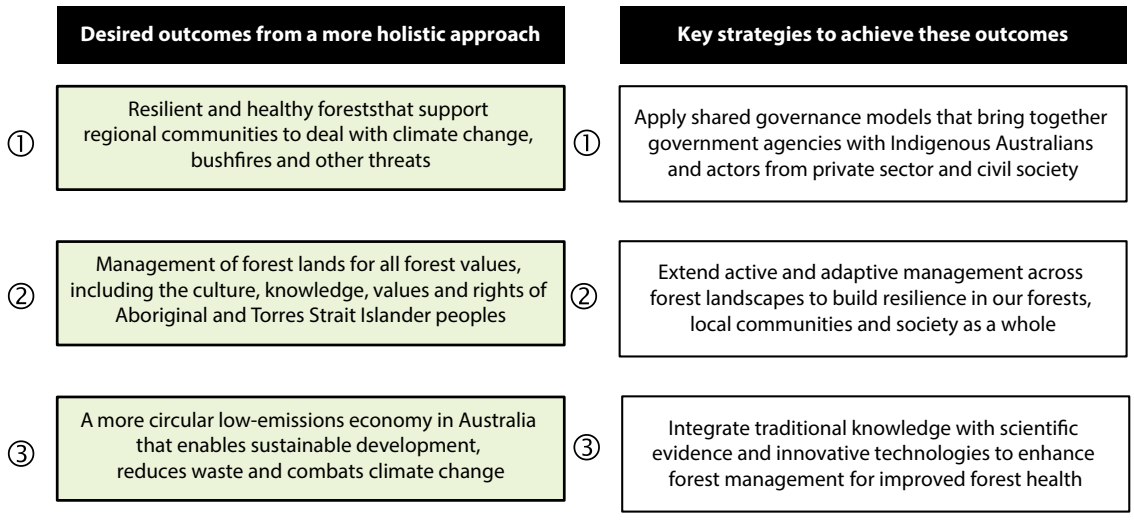

Figure 1. Key considerations for the development of a new shared vision for Australia's forests.

[2]See this relevant example of reporting on community conflict over forest management in Australia: https://www.theguardian.com/environment/2018/mar/20/regional-forest-agreement-renewals-spark-fresh-forest-wars.

with Indigenous Australians and actors from the private sector and civil society
(2) extending active and adaptive management across forest landscapes that builds resilience in our forests, local communities, and society as a whole
(3) integrating traditional knowledge with scientific evidence and innovative technologies to enhance forest management for improved forest health and resilience.

Establishing new shared governance for integrated, collaborative management

First, there is a need to manage forest lands as an integrated whole. Thackway et al. (2005) proposed an integrated framework for managing forest and non-forest lands by applying ecosystem-based approaches to bioregional land management and planning.

Forest governance is complex, in large part because forests can provide many different values, and this has often generated conflict between those with different views (Keenan 2019). In Australia, forest governance models are predominantly tenure-based and, in broad terms, there is limited integration across institutions, landscapes and tenures (Kanowski 2017).

These observations have given rise to previous calls for new approaches to policy development and implementation that 'recognize and accommodate the plurality of interests in forests', enhance coordination and integration between institutions and across landscapes, and empower and enable the diverse communities of interest in forests (Kanowski 2017).

International research on new governance models for natural resource management reflects an increasing preference for more collaborative approaches that bring together government and non-government actors from the private sector and civil society, including First Nations and Indigenous Peoples. New governance models need to have the capacity to deal with complexity and uncertainty; manage interdependencies among actors; foster connectedness between diverse interests at different scales and across jurisdictions; and galvanise resources, skills and knowledge more effectively than current conventional government practice (Lockwood et al. 2010).

An extensive study of natural resource management authorities in Australia led to the identification of eight principles that can be used as guidance for the establishment of good-practice, multilevel governance: legitimacy; transparency; accountability; inclusiveness; fairness; integration; capability; and adaptability (Lockwood et al. 2010). These principles are also relevant for addressing the complex environmental policy challenges presented by forest management. Although similar principles were applied in the assessment of ecological sustainable forest management in developing RFAs in the 1990s (Davey 2018), there has been no continued monitoring of these principles to ensure the realisation of good-practice, multilevel governance across public forest landscapes.

There is no 'one size fits all' arrangement. To address current and emerging challenges facing Australia's forests, we need new and innovative governance models and partnerships that:

- respect the culture, knowledge, practices, values, views and rights of Aboriginal and Torres Strait Islander peoples and the overall interests of society
- genuinely engage stakeholders in forest-related decisions that affect them, with clear recognition that the health of our society is closely tied to the health of our forests
- monitor governance arrangements to ensure the integrated and collaborative management of all forest values across the public forest estate
- enable the Australian community to develop an improved understanding of the functioning and benefits of forests and the need to actively manage forests
- ensure that the benefits of forest management primarily flow to regional communities, thereby providing the resources needed for local management, jobs, enterprises and social benefits
- promote collaborative decision-making processes that are transparent, fair and effective.

Canada, Finland, Germany and Sweden all have leading examples of shared-governance models that show how forest management functions can be integrated across government (Moore & Tjornbo 2012; Borrass et al. 2017; Eriksson et al. 2018; Rantala et al. 2020). In Canada, landmark agreements have been reached between provincial governments, First Nations, industry and non-government organisations (Price et al. 2009). In the Nordic countries, there are durable models in which single forest management agencies have responsibility for managing forests for conservation and sustainable use.

Australian states and territories should develop integrated land management agencies that include a clear focus on native title settlement processes, collaborative management, and increased accountability for all forest values.

Extending active and adaptive management across forest landscapes to increase forest resilience

Second, there is a need for active and adaptive management across forest landscapes to strengthen their resilience to climate change, bushfires and other threats.

In the wake of last summer's bushfires across Australia (Davey & Sarre 2020), there were calls for public natural forests to be left untouched to recover (Lindenmayer et al. 2020). Certainly, extensive areas of burnt forest now need to be protected and carefully managed to enable natural recovery processes to take effect. However, the paradox of this situation is that one of the primary causes of the destructive impacts of those and previous bushfires has been a 'lack' of active and adaptive land management over past decades (Morgan et al. 2020)—specifically, a lack of fuel reduction and limited development of forest mosaics and strategic fire breaks to slow or halt the spread of fires. Humanity has altered forest landscapes to such an extent that they now require active management to ensure ecosystem health and build resilience to bushfires and climate change.

International wildfire experts note that mitigating bushfire disasters will require greater use of prescribed burning in suitable forest types to reduce bushfire risks and impacts (Moreira et al. 2020; Morgan et al. 2020), while recognising it is not a panacea for major bushfires and can have limited impact on slowing major bushfires under extreme conditions

(Hislop et al. 2020). Similarly, leading forest policy researchers have observed the need for a national bushfire policy and that active land management such as prescribed burning and forest thinning must be at the core of any such policy.

Rather than leaving nature to take its course, there is a need for the more active and adaptive management of forests to maintain or enhance ecological functionality and improve forest resilience to shocks such as landscape-scale severe bushfires and the impact of climate change. The need for adaptive forest management as a prerequisite for sustainable forestry in the face of climate change is recognised by European ecologists (Bolte et al. 2010)—an integral part of an overall strategy of 'avoiding the unmanageable and managing the unavoidable' (Bolte et al. 2010, p. 116) and, specifically, of avoiding climate change becoming a global catastrophe.

In the United States of America, extensive fires have ravaged forests and rangelands across the western states over the past two decades (Williams et al. 2019). In the face of catastrophic fires in 2020, occurring less than two years after the devastating bushfires of 2017 and 2018 that burnt over 1.4 million ha, California's Deputy Director of Resource Management stated:

> 'We're kind of past the point of "Do No Harm". We're going to have to have forest management. It's challenging but not unsolvable . . . We have the leading scientists and there is an emerging consensus on best practices. It's now a matter of learning by doing it, and just getting dirty' (Helvarg 2020).

Indigenous Australians are also calling for more active and adaptive management to care for country and keep it healthy. In Victoria, the Federation of Traditional Owners has stated that we need a more holistic and landscape view of planning and management:

> 'We view the natural world within an interconnected ecological, cultural and livelihood system. Land and waters managed for landscape and community health require active management to be able to restore, maintain and enhance its biodiversity and to improve its ability to effectively recover from shocks and stresses. We take a holistic and landscape view for planning and management, using fire as an integral management tool for maintaining a productive landscape' (DELWP 2017, p. 7).

Active management means a preparedness to conduct interventions that will conserve and restore biological diversity, ecological functions and evolutionary processes at multiple spatial and temporal scales. It incorporates better management of fires, with effective use of prescribed burning, through methods that include traditional Aboriginal land management and cultural burning (Binskin et al. 2020; Morgan et al. 2020; Owens & O'Kane 2020). It may also include silvicultural interventions to restore or enhance structural diversity and increase resilience to bushfires and other shocks while maintaining biodiversity at the landscape level (Messier et al. 2014; Gonsalves et al. 2018).

To be clear, active management is not a call for commercial timber harvesting in national parks and conservation reserves. It is a call to recognise forests as complex systems and to actively manage forests for their health, to maintain their full range of values and to build resilience (Woinarski et al. 2011). Active management includes reducing the threats to forests, preparing forests for future threats, maintaining the capacity of forests to recover after disturbances, and restoring forests that have been degraded.

Adaptive management acknowledges the complexity of natural ecosystems and the uncertainty associated with a broad range of biological, political, social and climatic challenges facing forests. In North America, there is a substantial body of research based on managing forests as 'complex adaptive systems', which provides a scientific foundation that not only acknowledges and accommodates uncertainty but also helps both production- and conservation-oriented forest managers as well as policymakers to better understand how ecosystems respond to change and how management can influence these responses (Messier et al. 2014).

Adaptive management is promoted worldwide as an ongoing process of regularly setting and reviewing management objectives based on credible evidence, consulting with stakeholders, implementing forest management and conservation actions to achieve the planned objectives, and monitoring and evaluating the effectiveness of forest management as well as changes in forest health. Adaptive management requires robust modelling based on multiple lines of evidence that clearly shows the likely outcomes of forest management action or inaction. The effectiveness of forest management should also be regularly evaluated against the outcomes forecast by models. Such an approach can provide stronger assurance to a broad range of stakeholders that Australia's forests can be managed responsibly and sustainably.

Current and emerging technologies, including multi-satellite coverage and drones that provide increasingly clever and cost-effective ways to closely monitor forest health and key biodiversity metrics, will enable more timely adjustments to management strategies and actions.

Australia should develop systems, processes and models to support a new approach to managing public forests that incorporates active *and* adaptive management across forested landscapes.

Integrating traditional knowledge with scientific evidence and innovative technologies

Third, there is a need for comprehensive, reliable and timely data and information on the status and trend of a broad range of forest indicators, including ecological integrity, ecosystem services and the benefits and costs for society.

While improvements in the completeness and availability of data on key indicators used in forest management have been made in recent decades (MPIGA & NFISC 2018; Read & Howell 2019), substantial data gaps remain (MPIGA & NFISC 2018). In some cases, data and information do not cover a sufficiently long period to allow the assessment of trends in forest indicators. Critically, information on the impacts of climate change on forest management is inadequate (see Keenan 2017), and publicly available data and reports do not readily allow the determination of management effectiveness both within and outside the national reserve system in terms of biodiversity goals.

Further work and funding are also required to expand and bring together research, scientific assessment and traditional knowledge to identify and prioritise active and adaptive management opportunities. As pointed out by Kile et al. (2014), Ferguson (2015) and Kanowski (2017), Australia's research capacity to support adaptive forest management has declined significantly with each decade since the 1980s. Turner and Lambert (2016) reported forest research

expenditure in Australia in 2013 at around AUD 48 million, which represented a reduction of about 60% from forestry research expenditure in the mid-1980s.

Although Australia's knowledge generation and analysis relevant to forests is relatively substantial and sophisticated, Kanowski (2017) noted that some of the key challenges are more at the interface between knowledge and governance, and in the integration across sectors, than in the limitations of knowledge itself. Notwithstanding this, knowledge remains contested in various arenas of Australian forest governance, and these contested areas can impede or confound policy decisions and management actions. Having access to credible evidence is not only important for adaptive forest management but also essential for society to make informed decisions about the future of Australia's forests. The ongoing conflict over how forests should be managed is often fuelled by misinformation and opinions. This has led to forest management and use decisions that fail to achieve ecological integrity and meet human wellbeing needs.

Forest policy and forest management decisions must be based on scientific evidence and traditional knowledge. Regular monitoring and transparent reporting on the status of and trends in forests and the effectiveness of forest management actions are key to informing and updating our understanding over time. These data should underpin adaptations in policy and management.

In light of this, there is a need to review the indicators used to report on forests and forest-dependent industries, including a review of gaps such as climate and an assessment of the relevance and effectiveness of current forest-related indicators. There is also a need to improve public reporting for all forests using approaches that can be understood easily by decision-makers and the community. These datasets need to be properly curated and publicly available.

Furthermore, a more collaborative approach to research and improved efforts to build scientific consensus about forest-related issues is important for achieving active and adaptive forest management outcomes. Citizen science offers great potential to improve datasets, particularly using technology that enables geo-location, species identification and instantaneous reporting.

This will require more people in the bush—more Indigenous and local rangers working with local communities to actively manage forests according to local needs and local knowledge of the landscape. This, in turn, will require a quantum shift in resources for forest management and new modes of finance involving public- and private-sector partners. The savannah burning programs across northern Australia are examples of how private-sector and government carbon finance is providing resources to put people back on country to restore ecosystems and the physical and mental health and cultures of Indigenous communities (Barber & Jackson 2017; Russell-Smith et al. 2017; Russell-Smith et al. 2018).

Australia should implement strategies to bring together scientific evidence and traditional knowledge to better understand the status, trends and effectiveness of forest management and policy decisions.

Creating a circular, low-emissions economy

The strategies outlined above have the potential to substantially improve the management of Australia's forests and thereby increase forest resilience to shocks and stresses, such as those generated by bushfires and invasive species and those anticipated with climate change. These strategies will also strengthen Australia's capacity to shift from a linear to a more circular economy.

In a traditional linear economy, resources are taken to make into products that are used and then disposed of (Lambert 2018). The circular economy is an alternative construct in which the goal is to keep resources in use for as long as possible (Commonwealth of Australia 2018), extract the maximum value from them while in use, then recover and regenerate products and materials for further production and consumption (Lambert 2018). In a circular economy, resources are obtained sustainably and recycled as much as possible, including through advanced and emerging technologies based on renewable resources.

Australia is the sixth most forested country in the world (after the Russian Federation, Brazil, Canada, the United States and China) with 3.3% of the world's forests (FAO & UNEP 2020). As stewards of such a significant portion of the world's forests, Australia has not only the opportunity but a global responsibility to manage its forests in accordance with internationally recognised principles of ecologically sustainable development. Australia's *National Strategy for Ecologically Sustainable Development* (Commonwealth of Australia 1992b) defines ecologically sustainable development as: using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.

These principles should be applied to forest management and the sustainable use of forest resources in Australia as part of the development of a more circular, low-emissions economy. There are several reasons for optimising the utilisation of our own forest resources, both natural and planted, in these contexts. These include the emissions associated with international trade (e.g. OECD 2021) and the limitations of relying on legality and sustainability systems in other countries (e.g. Garcia 2017).

Although globalisation and international trade are key drivers of global prosperity, climate change and the COVID-19 pandemic have highlighted the dependencies and risks associated with a highly connected world and the need for sustainable production systems in Australia and more resilience in the economy.

The federal and state governments in Australia have embraced the principles of a circular economy (Commonwealth of Australia 2018; NSW Government 2019; DELWP 2020; DWER 2020), which ultimately is intended to change patterns of natural resource use to achieve sustainable growth. This includes avoiding waste and pollution, keeping existing products and materials in use, regenerating natural systems, and better managing material flows to benefit human health, the environment and the economy.

Wood has been described as the ultimate renewable[3] material, and the federal government has recognised that trees are a sustainable, renewable resource for future generations when carefully managed (DAWE 2019). Wood also provides

[3]The Ultimate Renewable™ is an industry campaign to promote the sustainability and environmental advantages of Australian forestry and wood products. Further information is available at: https://www.theultimaterenewable.com.au/.

a sophisticated alternative to other building materials that generate more greenhouse gas emissions in their production. In this way, the use of renewable forest fibre and wood products, sourced from Australian plantations and sustainably managed natural forests, is clearly aligned with established policy principles and would contribute directly to building and strengthening a circular economy in Australia.

Australia can draw on the lessons being learned in Europe and Canada, which have established national strategies focused on the development of bioeconomies; these incorporate the principle of a circular economy but extend it to encompass the sustainable use of renewable biological resources.

In Europe, there is a policy goal for a more innovative and low-emissions economy, reconciling the demands for sustainable agriculture and fisheries, food security, and the sustainable use of renewable biological resources for industrial purposes while ensuring biodiversity and environmental protection. To achieve this, the European Commission first established a bioeconomy strategy in 2012 (European Commission 2012; Winkel 2017). This strategy encompassed support for research and development across agriculture, forestry, fisheries, food and pulp and paper production, as well as parts of chemical, biotechnological and energy industries to promote innovation for sustainable growth in Europe. It was updated in 2019 (European Commission 2019).

Similarly, Canada's National Bioeconomy Strategy (Bioindustrial Innovation Canada 2019) notes that the country's competitive advantages for a bioeconomy include its access to biomass, global leadership in forestry and agriculture, sustainable resource management and skilled workforce. The strategy features the need to establish a biomass supply and good stewardship of agricultural and forestry lands.

Given these international examples, there is an opportunity for Australia to establish itself as a global leader by shifting from a linear to a circular economy. Such a shift would support the further development of advanced technologies and a highly skilled workforce equipped to compete in global markets.

For Australia to transition to a more circular, low-emissions economy based on the increased use of renewable energy and sustainable forest products, key initiatives would likely need to include:

- ensuring that Australia's forest biodiversity is adequately conserved through complementary management within and outside the reserve system
- increasing investment in plantations as a renewable source of forest fibre and timber products
- supporting innovation and development for renewable and sustainably managed products from natural forests and plantations that have a lower emissions intensity compared to other products and can be recycled for long-term use and carbon storage
- enhancing the utilisation of forest residues associated with sustainable forest management activities
- supporting innovation and development for the manufacturing of engineered wood products to meet society's consumption requirements efficiently with available forest resources (doing more with less), notably through an increased reliance on plantation resources using, for example, engineered wood products such as cross-laminated timber.

The way forward

Australia's forest lands are at risk of losing their natural resilience to recover from shocks and disturbances. More active, adaptive and integrated forest management, incorporating the principles of Indigenous Australians and led by them, is fundamental to addressing this issue; but first we need to redress the legacy of past approaches that have hampered forest management policies, systems and structures and created an environment where stakeholder conflict and ineffective management decisions predominate. We need to envisage and adopt new ways of doing to promote forest resilience and support resilient and sustainable communities.

We encourage the federal and state governments of Australia to lead a collaborative initiative to convene with a broad range of stakeholders to discuss and develop a new shared vision for the management of natural forest lands, based on the strategies outline above. We consider the federal and state governments to be the most appropriate initiators of this process, recognising that the management of public forests is a major source of contention and that governments are responsible for establishing the governance arrangements, policy settings and regulatory frameworks for forests.

We suggest a multiphased approach that takes into account national-, state- and regional-level responsibilities for key functions, including land management, environmental protection and economic development. In the first phase, the federal and state governments could convene a meeting through a national-cabinet-style process, as seen in response to the COVID-19 pandemic. The intergovernmental meeting should engage and explore key issues relating to:

- the importance of maintaining resilient and healthy forests across all land tenures to address the challenges of climate change, while also developing a more circular, low-emissions economy in Australia
- concurrently, the importance of recognising the role of Traditional Owners in caring for country and the management of land, including forests, and the need to increase their involvement in decision-making
- observations on other national and intergovernmental policy commitments, such as in Europe and Canada, to establish a forest-based bioeconomy encompassing economic activities relating to *all* forest ecosystem services through plans and strategies designed to 'tackle sustainability-related conflicts and maximise sustainability-related synergies' (Winkel 2017)
- the overarching principles that should be applied consistently across all states in respect to forest management and community expectations of forest management and uses
- the utility of the platform provided by the RFAs in Australia to develop more socially inclusive governance arrangements for forest management at the subnational level
- the respective roles of federal and state governments in convening forums with a broad base of stakeholders to discuss socially inclusive governance arrangements for forest management at the subnational level
- collective views on whether the focus of these forums should be specifically on sustainable forest management across public land tenures or a broader, multisectoral consideration of the development of a more circular, low-emissions economy, if not a bioeconomy, in Australia.

In the second phase, it is suggested that state governments convene state-based meetings or forums with key stakeholders and representative organisations to discuss the development of a new shared vision for the management of public forest lands (which may inform private natural forestry in due course). Initial meetings of these state-based forums should be directed to scoping the process for engagement and an ongoing dialogue among stakeholders, in contrast to seeking agreement directly on a new vision or solution.

Through the scoping phase for further work in Australia, particular attention should be given to bringing together Traditional Owners and Indigenous Australians with key actors from the private sector and civil society and drawing on a broad base of inputs to a workable process for ongoing dialogue based on the principles of active and adaptive forest management across public land.

In designing these forums, state governments could refer to or engage with The Forests Dialogue (TFD), an international initiative that provides leaders in the forest sector with an ongoing, multistakeholder dialogue (MSD) platform and process focused on developing mutual trust, a shared understanding and collaborative solutions to challenges in achieving sustainable forest management and forest conservation around the world.

Regionally specific references may include international case studies, such as the development of the Great Bear Rainforest Land Use Agreement in British Columbia, Canada, in which stakeholder groups and First Nations took leadership roles and worked together to propose solutions to governments (Moore & Tjornbo 2012); in this case, the model centred on ecosystem-based management (Price et al. 2009). Another relevant example from North America is the *Healthy Forests, Healthy Communities* paradigm promoted in the United States, which in states like Oregon has focused on the need for active management to address the 'forest health crisis'. For example, this might mean management to restore forests susceptible to historically atypical large-scale fire and insect and disease infestations; and acknowledging the critical importance of local community capacity to support forest restoration and stewardship, which in turn provides communities with economic and cultural benefits (Kelly & Bliss 2009).

We believe it is important that, from the outset, these forums recognise the broad range of roles that forests can play in addressing the challenges of climate change and the multiple demands of pluralistic societies. These forums should also recognise the momentum building in other countries for the more active and adaptive management of forests and the opportunity to 'build back better' through the post-COVID-19 recovery across a range of sectors, including forestry and forest use. This recognition may assist in bringing a diverse range of stakeholders together with a shared understanding of the complex interdependencies between society and the natural environment and the need for a holistic approach to ecologically sustainable development in Australia.

Following broad agreement on the process or processes for ongoing dialogue, stakeholders at the state and regional levels could then continue to meet and support the development of a new shared vision for forests within the respective state or region. These forums could be further informed by the TFD experience worldwide or be based on existing platforms for MSD in Australia, such as Catchment Management Authority programs or state government-led regional development initiatives.

Through ongoing dialogue, we envisage that the multistakeholder forums would focus on the needs of individual regions and communities and strive to agree on new governance arrangements that are socially inclusive and respectful of all forest values. These forms of engagement may then effectively empower land management agencies to implement actions aligned with that vision, and these agencies could assume responsibility for providing monitoring reports over time.

In this way, through collective action across multiple states and regions, the realisation of a new shared vision for the management of Australia's forests would represent a nature-based solution contributing directly to post-COVID recovery and mitigating the threats of climate change and bushfire.

Acknowledgements

This work was stimulated by forest policy working group discussions conducted as part of the Institute of Foresters of Australia & Australian Forest Growers' policy review and dialogue processes. We thank Dr Stuart Davey and Pip Band for their invaluable assistance with the development of this paper; Professor Peter Kanowski, Professor Rod Keenan and Associate Professor Richard Thackway, in particular, for their prior work and perspectives from which this paper draws; and two anonymous reviewers for their most helpful reviews. Opinions, omissions and errors remain the authors' responsibility.

Disclosure statement

No potential conflict of interest was reported by the authors.

ORCID

W. Jackson http://orcid.org/0000-0002-7435-5723
M. Freeman http://orcid.org/0000-0002-5132-1125

References

Barber M, Jackson S. 2017. Identifying and categorizing cobenefits in state-supported Australian Indigenous environmental management programs: international research implications. Ecology and Society. 22(2):11. doi:10.5751/ES-09114-220211.

Binskin M, Bennett A, Macintosh A. 2020. Interim observations. Canberra (Australia): Royal Commission into National Natural Disaster Arrangements, 31 Aug. [accessed 2020 Sep 10]. Available from: https://naturaldisaster.royalcommission.gov.au/system/files/2020-08/Interim%20Observations%20-31%20August%202020_0.pdf

Bioindustrial Innovation Canada. 2019. Canada's bioeconomy strategy: leveraging our strengths for a sustainable future. Sarnia (Canada): Bioindustrial Innovation Canada. [accessed 2020 Aug 15]. Available from: https://www.fpac.ca/wp-content/uploads/b22338_1906a509c5c44870a6391f4bde54a7b1.pdf

Bolte A, Ammer C, Löf M, Nabuurs GJ, Schall P, Spathelf P. 2010. Adaptive forest management: a prerequisite for sustainable forestry in the face of climate change. In: Spathelf P, editor. Sustainable forest management in a changing world – a European perspective. Managing forest ecosystems. Vol. 19. Chapter 8. Dordrecht (Netherlands): Springer; p. 115–139. doi:10.1007/978-90-481-3301-7-8.

Borrass L, Kleinschmit D, Winkel G. 2017. The "German model" of integrative multifunctional forest management—analysing the emergence and political evolution of a forest management concept. Forest Policy and Economics. 77:16–23. doi:10.1016/j.forpol.2016.06.028.

Commonwealth of Australia. 1992a. National Forest Policy Statement: a new focus for Australia's forests. 2nd ed. Canberra (Australia): Australian Government Publishing Service. [accessed 2020 Aug 15]. Available from: https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/forestry/australias-forest-policies/nat_nfps.pdf

Commonwealth of Australia. 1992b. National strategy for ecologically sustainable development. Canberra (Australia): Australian Government Publishing Service.
Commonwealth of Australia. 2018. National waste policy 2018. Canberra (Australia): Australian Government Publishing Service.
Davey SM. 2018. Regional forest agreements: origins, development and contributions. Australian Forestry. 81:64–88. doi:10.1080/00049158.2018.1458701.
Davey SM, Sarre A. 2020. Editorial: the 2019/20 Black Summer bushfires. Australian Forestry. 83:47–51. doi:10.1080/00049158.2020.1769899.
DAWE. 2019. Wood – the ultimate renewable. Canberra (Australia): Australian Government Department of Agriculture, Water and the Environment. [accessed 2020 Sep 10]. Available from: https://www.agriculture.gov.au/forestry/planning-tomorrow/wood-the-ultimate-renewable
DAWR. 2019. New South Wales regional forest agreements. Canberra (Australia): Department of Agriculture and Water Resource. [accessed 2020 Oct 15]. Available from: http://www.agriculture.gov.au/forestry/policies/rfa/regions/new-south-wales
DELWP. 2017. Protecting Victoria's environment – biodiversity 2037. Melbourne (Australia): Department of Environment, Land, Water and Planning. [accessed 2020 Aug 15]. Available from: https://www.environment.vic.gov.au/__data/assets/pdf_file/0022/51259/Protecting-Victorias-Environment-Biodiversity-2037.pdf
DELWP. 2020. Recycling Victoria: a new economy. Melbourne (Australia): Department of Environment, Land, Water and Planning, Feb. [accessed 2020 Oct 15]. Available from: https://www.vic.gov.au/sites/default/files/2020-02/Recycling%20Victoria%20A%20new%20economy.pdf
DWER. 2020. Closing the loop – waste reforms for a circular economy. Consultation paper, Feb. Perth (Australia): Department of Water and Environmental Regulation. [accessed 2020 Oct 15]. Available from: https://dwer.wa.gov.au/sites/default/files/Closing%20the%20loop%20-%20Waste%20reforms%20for%20a%20circular%20economy%20_0.pdf
Eriksson M, Samuelson L, Jägrud L. 2018. Water, forests, people: the Swedish experience in building resilient landscapes. Environmental Management. 62:45–57. doi:10.1007/s00267-018-1066-x.
European Commission. 2012. Innovating for sustainable growth: a bioeconomy for Europe. Brussels (Belgium): European Commission. [accessed 2020 Sep 10]. Available from: https://op.europa.eu/en/publication-detail/-/publication/1f0d8515-8dc0-4435-ba53-9570e47dbd51
European Commission. 2019. Bioeconomy policy. Brussels (Belgium): European Commission. [accessed 2020 Sep 10]. Available from: https://ec.europa.eu/research/bioeconomy/index.cfm?pg=policy
FAO & UNEP. 2020. State of the world's forests 2020: forests, biodiversity and people. Rome (Italy): Food and Agriculture Organization of the United Nations and UN Environment Programme. [accessed 2020 Sep 10]. Available from: http://www.fao.org/state-of-forests/en/
Ferguson IS. 2015. Forestry R&D in Australia: a response to Kile et al. (2014). Australian Forestry. 78:111–113. doi:10.1080/00049158.2015.1063799.
Garcia B. 2017. Australia might water down illegal logging laws – here's why it's a bad idea. The Conservation. [accessed 2020 Oct 15]. Available from: https://theconversation.com/australia-might-water-down-illegal-logging-laws-heres-why-its-a-bad-idea–86832
Gonsalves L, Law B, Brassil T, Waters C, Toole I, Tap P. 2018. Ecological outcomes for multiple taxa from silvicultural thinning of regrowth forest. Forest Ecology and Management. 425:1770188. doi:10.1016/j.foreco.2018.05.026.
Helvarg D. 2020. How will California prevent more mega-wildfire disasters? National Geographic. [accessed 2020 Sep 10]. Available from: https://www.nationalgeographic.com/science/2019/12/how-will-california-prevent-more-mega-wildfire-disasters/
Hislop S, Stone C, Haywood A, Skidmore A. 2020. The effectiveness of fuel reduction burning for wildfire mitigation in sclerophyll forests. Australian Forestry. 83(4):255–264. doi:10.1080/00049158.2020.1835032.
IUCN. 2020. Nature-based solutions. Gland (Switzerland): International Union for Conservation of Nature. [accessed 2020 Oct 15]. Available from: https://www.iucn.org/theme/nature-based-solutions
Jackson WJ. 2019. Modernisation of the Victorian Regional Forest Agreements. Independent Consultation Paper. [accessed 2020 Sep 10]. Available from: https://s3.ap-southeast-2.amazonws.com
Jackson WJ, Argent RM, Bax NJ, Clark GF, Coleman S, Cresswell ID, Emmerson KM, Evans K, Hibberd MF, Johnston EL, et al. 2017. Australia state of the environment 2016: overview, independent report to the Australian Government Minister for the environment and energy. Canberra (Australia): Department of the Environment and Energy. [accessed 2020 Sep 10]. Available from: https://soe.environment.gov.au/theme/overview
Jacobsen R, Davey SM, Read SM. 2020. Regional forest agreements: compilation of reservation and resource availability outcomes. Canberra (Australia): Australian Bureau of Agricultural Resources Economics and Sciences. ABARES Technical report 11, December. doi:10.25814/n975-d613.
Kanowski PJ. 2017. Australia's forests: contested past, tenure-driven present, uncertain future. Forest Policy and Economics. 77:56–68. doi:10.1016/j.forpol.2015.06.001.
Keenan RJ. 2017. Climate change and Australian production forests: impacts and adaptation. Australian Forestry. 80:197–207. doi:10.1080/00049158.2017.1360170.
Keenan R. 2019. A new era for science in forest policy. Asia & The Pacific Policy Society – Policy Forum, 26 Aug. [accessed 2020 Sep 10]. Available from: https://www.policyforum.net/a-new-era-for-science-in-forest-policy/
Kelly EC, Bliss JC. 2009. Healthy forests, healthy communities: an emerging paradigm for natural resource-dependent communities? Society & Natural Resources: An International Journal. 22(6):519–537. doi:10.1080/08941920802074363.
Kile GA, Nambiar EKS, Brown AG. 2014. The rise and fall of research and development for the forest industry in Australia. Australian Forestry. 77:142–152. doi:10.1080/00049158.2014.990867.
Lambert C, Delegation of the EU to Australia. 2018. The EU circular economy vision: a powerful force for climate action. Presentation at Australian National University; 10 Jul 2018; Canberra (Australia). [accessed 2020 Oct 15]. Available from: http://climate.anu.edu.au/files/circular%20economy%20anu%20july%202018.pdf
Lindenmayer DB, Kooyman RM, Taylor C, Ward M, Watson JEM. 2020. Recent Australian wildfires made worse by logging and associated forest management. Nature Ecology & Evolution. 4:898–900. doi:10.1038/s41559-020-1195-5.
Lockwood M, Davidson J, Curtis A, Stratford E, Griffith R. 2010. Governance principles for natural resource management. Society & Natural Resources. 23:986–1001. doi:10.1080/08941920802178214.
Messier C, Puettmann K, Chazdon R, Andersson KP, Angers VA, Brotons L, Filotas E, Tittler R, Parrott L, Levin SA. 2014. From management to stewardship: viewing forests as complex adaptive systems in an uncertain world. Conservation Letters. 8:368–377. doi:10.1111/conl.12156.
Moore M-L, Tjornbo O. 2012. From coastal timber supply area to Great Bear Rainforest: exploring power in a social–ecological governance innovation. Ecology and Society. 17(4):26. doi:10.5751/ES-05194-170426.
Moreira F, Ascoli D, Safford H, Adams M, Moreno J, Pereira J, Catry F, Armesto JJ, Bond W, González M, et al. 2020. Wildfire management in Mediterranean-type regions: paradigm change needed. Environmental Research Letters. 15:011001. doi:10.1088/1748-9326/ab541e.
Morgan GW, Tolhurst KG, Poynter MW, Cooper N, McGuffoge T, Ryan R, Wouters MA, Stephens N, Black P, Sheehan D, et al. 2020. Prescribed burning in south-eastern Australia: history and future directions. Australian Forestry. 83:4–28. doi:10.1080/00049158.2020.1739883.
MPIGA & NFISC. 2018. Australia's State of the Forests Report 2018. Canberra (Australia): Montreal Process Implementation Group for Australia and National Forest Inventory Steering Committee. [accessed 2020 Sep 10]. Available from: www.agriculture.gov.au/abares/forestsaustralia/sofr/sofr-2018
NSW Government. 2019. NSW Circular Economy Policy Statement: too good to waste. Feb. [accessed 2020 Oct 15]. Available from: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/recycling/19p1379-circular-economy-policy-final.pdf
OECD. 2020. Building back better: a sustainable, resilient recovery after COVID-19. Paris (France): OECD Policy Response, Organisation for Economic Co-operation and Development. [accessed 2020 Oct 15]. Available from: http://www.oecd.org/coronavirus/policy-responses/building-back-better-a-sustainable-resilient-recovery-after-covid-19-52b869f5/
OECD. 2021. Carbon dioxide emissions embodied in international trade. Paris (France): OECD Policy Response, Organisation for Economic Co-operation and Development. [accessed 2021 Jan 8]. Available from: https://www.oecd.org/sti/ind/carbondioxideemissionsembodiedininternationaltrade.htm

Owens D, O'Kane M. 2020. Final report of the NSW bushfire inquiry (31 July 2020). Sydney (Australia): New South Wales Premier & Cabinet. Available from: https://www.dpc.nsw.gov.au/assets/dpc-nsw-gov-au/publications/NSW-Bushfire-Inquiry-1630/Final-Report-of-the-NSW-Bushfire-Inquiry.pdf

Price K, Roburn A, Mackinnon A. 2009. Ecosystem-based management in the great bear rainforest. Forest Ecology and Management. 258:495–503. doi:10.1016/j.foreco.2008.10.010.

Rantala S, Swallow B, Paloniemi R, Raitanen E. 2020. Governance of forests and governance of forest information: interlinkages in the age of open and digital data. Forest Policy and Economics. 113:102123. doi:10.1016/j.forpol.2020.102123.

Read S, Howell C. 2019. National 'state of the forests' reporting in Australia. Australian Forestry. 82:53–55. doi:10.1080/00049158.2019.1601827.

Russell-Smith J, Sangha KK, Costanza R, Kubiszewski I, Edwards A. 2018. Towards a sustainable, diversified land sector economy for North Australia. In: Russell-Smith J, James G, Pedersen H, Sangha KK, editors. Sustainable land sector development in Northern Australia. Chapter 5. Boca Raton (FL): Taylor and Francis; p. 85–132.

Russell-Smith J, Monagle C, Jacobsohn M, Beatty RL, Bilbao B, Millán A, Vessuri H, Sánchez-Rose I. 2017. Can savanna burning projects deliver measurable greenhouse emissions reductions and sustainable livelihood opportunities in fire-prone settings? Climatic Change. 140 (1):47–61. doi:10.1007/s10584-013-0910-5.

Thackway R, Davey S, Hoare J, Cresswell ID. 2005. Strategies for an integrated approach to ecologically sustainable land management. Australasian Journal of Environmental Management. 12:66–76. doi:10.1080/14486563.2005.10648636.

Turner J, Lambert M. 2016. Changes in Australian forestry and forest products research for 1985–2013. Australian Forestry. 79:53–58. doi:10.1080/00049158.2015.1095853.

Williams AP, Abatzoglou JT, Gershunov A, Guzman-Morales J, Bishop DA, Balch JK, Lettenmaier DP. 2019. Observed impacts of anthropogenic climate change on wildfire in California. Earth's Future. 7(8):892–910. doi:10.1029/2019EF001210.

Winkel G, editor. 2017. Towards a sustainable European forest-based bioeconomy. What Science Can Tell Us Series 8. Sarjanr (Finland): European Forest Institute.

Wintle BA, Cadenhead NCR, Morgain RA, Legge SM, Bekessy SA, Cantele M, Possingham HP, Watson JEM, Maron M, Keith DA, et al. 2019. Spending to save: what will it cost to halt Australia's extinction crisis? Conservation Letters. 12(6):1–7. doi:10.1111/conl.12682.

Woinarski JCZ, Burbidge AA, Harrison PL. 2015. Ongoing unravelling of a continental fauna: decline and extinction of Australian mammals since European settlement. Proceedings of the National Academy of Sciences. 112(15):4531–4540. doi:10.1073/pnas.1417301112.

Woinarski JCZ, Legge S, Fitzsimons JA, Traill BJ, Burbidge AA, Fisher A, Firth RSC, Gordon IJ, Griffiths AD, Johnson CN, et al. 2011. The disappearing mammal fauna of northern Australia: context, cause, and response. Conservation Letters. 4:192–201. doi:10.1111/j.1755-263X.2011.00164.x.

WWF. 2020. Living planet report 2020 – bending the curve of biodiversity loss. In: Almond REA, Grooten M, Petersen T, editors. Gland (Switzerland): World Wildlife Fund; p. 76. [accessed 2020 Oct 15]. Available from: https://www.icriforum.org/wp-content/uploads/2020/09/LPR20_Full_report.pdf.