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Distributive and contextual equity in landholder participation in biodiversity offsets: a case study of biodiversity offsets in New South Wales, Australia

Laure-Elise Ruoso and Roel Plant

Institute for Sustainable Futures, University of Technology Sydney, Sydney, Australia

ABSTRACT

While the challenges represented by biodiversity offsets in terms of biodiversity outcomes have been scrutinised in the scientific literature, less attention has been paid to the equity challenges they represent, particularly with regard to landholders' individual ability to participate in biodiversity offsets. We address this knowledge gap by providing insights into the factors that enable some landholders and prevent others to participate in the biodiversity offset scheme operating in New South Wales (NSW, Australia). To do so, we build on the literature on Payment for Ecosystem Services (PES), which addresses a range of equity challenges related to PES, albeit with a specific focus on developing countries. Our results show that experience, access to resources and information, support through formal and informal networks and land size explain why some landholders manage to participate in the biodiversity offset scheme in NSW, while others do not. In the discussion, we focus on identifying the support non-participating landholders would need in order to participate in the scheme and we provide recommendations to improve the equity in landholders' access to biodiversity offsets in New South Wales. We also discuss the specificity of equity dimensions in a developed country context.

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1. Introduction

Biodiversity offsets can be defined as: (1) the supply of an ecological gain, (2) in response to an ecological loss, (3) located in a compensation site distinct from the impacted site, (4) following agreed-upon criteria for the ecological equivalence between gains and losses (Vaissière et al. 2020). The idea of compensating for biodiversity loss first emerged at the 1972 Ramsar Convention (Hrabanski 2015). The policy rationale for the development and implementation of biodiversity offsets is that offsets embed the accounting of biodiversity within development activities (Bull et al. 2013).

Offsetting was first implemented in the USA in the 1970s and progressively spread to Australia and Europe in the 1990s and 2000s (Damiens et al. 2020). More recently, biodiversity offsets have also been adopted in Latin America, where Brazil and Mexico have the highest numbers of offset projects recorded, and to a lesser extent in Africa and Asia (Bull and Strange 2018). By 2016, nearly 100 compensation or offset mechanisms had been implemented in 33 countries (Bennett et al. 2017). To date, in Australia, biodiversity offsetting mechanisms have been implemented at the federal level as well as in several states, among which New South Wales (NSW).

Different methods exist to implement and manage biodiversity offsets (Froger et al. 2015). Offsets can be carried out in an 'ad hoc' manner, where

ecological measures (restoration, rehabilitation or preservation) are implemented by the developer (or the service provider hired by the developer) in a site situated on or near the site developed. They can also take the form of financial transfers, where the developer pays a certain amount of money to environmental entities. Finally, biodiversity offsets can take the form of offset banking, where a supply of biodiversity credits is generated according to a specific accounting system and related methodology. The required credits can then be bought by developers to offset their impacts. The aim of the banking system was to overcome issues regarding the 'ad hoc' implementation of offsets by developers themselves. While the case study that will be explored in this article (the biodiversity offset scheme in NSW) is a banking system, the framing of the research problem presented below applies to biodiversity offsets more generally.

The idea that ecological loss – especially loss of native vegetation – could be compensated by providing an ecological gain on another site has been widely criticised and challenged in the scientific literature (Maron et al. 2012, 2016) and environmental activists' circles (Hrabanski 2015). Criticism of biodiversity offsetting often centres on its (lack of) ecological soundness, particularly whether offsets can indeed halt biodiversity losses. Both theoretical and practical challenges have been identified, such as choosing

appropriate metrics for measuring biodiversity, defining ‘no net loss’ of biodiversity and equivalence between losses and gains, tackling uncertainty regarding biodiversity outcomes, and monitoring compliance and outcomes among other things (Maron et al. 2012; Bull et al. 2013). In addition, biodiversity offsets have been shown to have the potential to lead to perverse outcomes, such as entrenching baseline declines by calculating ‘no net loss’ based on a declining counterfactual scenario (Gordon et al. 2015).

In order to align with the three pillars of sustainability, it could also be expected that in addition to rules related to ecological outcomes, rules would be established regarding the expected social outcomes of biodiversity offsets. And while international best practice recognises that individuals should be ‘no worse off’ (and even preferably ‘better off’) after the implementation of a biodiversity offset project, no guidelines exist on how to achieve that goal (Griffiths et al. 2019a). Even if the social dimension seems to have been less of a focus in biodiversity offset policies, a strand of literature has emerged that considers the question of the social outcomes of biodiversity offsets as crucial, and asks what biodiversity offsets mean for society, taking a political, ethical or social entry point. Some scholars adopt a radical approach, considering that offsets are not a viable solution for biodiversity conservation and have negative social outcomes. Others adopt a reformist approach, calling for improvement of the social/equity outcomes of biodiversity offsets (Hrabanski 2015). Critical ‘radical’ scholars (e.g. Hillman and Instone 2010; Spash 2015; Apostolopoulou and Adams 2017) see biodiversity offsets as contributing to the further ‘commodification of nature’ (Gómez-Baggethun and Ruiz-Pérez 2011), further ignoring the cultural and place-based values of biodiversity. Such omissions lead to negative equity outcomes for society at large, as a proportion of the population might lose access to natural areas it values. In contrast, a critical ‘reformist’ approach advocates for better accounting of the social and equity outcomes of offsets (BenDor et al. 2008; Bidaud et al. 2017; Griffiths et al. 2019a, 2019b).

Both the ‘radical’ and ‘reformist’ schools focus on the equity outcomes of biodiversity offsets for *society at large*, overlooking other equity challenges, such as those related to individual landholders’ access or ability to participate in biodiversity offsets. In contrast, the literature on Payment for Ecosystem Services (PES)¹ discusses a wider range of equity challenges (Porrás 2010; Sommerville et al. 2010; García-Amado et al. 2011; Krause and Loft 2013; Mahanty et al. 2013; McDermott et al. 2013; Pascual et al. 2014; Calvet-Mir et al. 2015; Haas et al. 2019).

While biodiversity offsets and PES have rather different premises – biodiversity offsets aim at mitigating the impact of biodiversity loss by offsetting impacts in one place through biodiversity gains in another place, whereas PES provide financial incentives to landholders to change their land-use practices in order to derive positive environmental outcomes based on a baseline scenario – Vaissière et al. (2020) argue that lessons learnt from PES could be used to improve biodiversity offsets, particularly regarding equity. Adopting this viewpoint, we build on the PES literature to develop our position regarding equity challenges related to biodiversity offsets.

In this paper, we look into the equity challenges faced by the biodiversity offset scheme implemented in NSW, Australia, with particular focus on access to the scheme on the supplier’s side (i.e. supplier of ecological gain). Prior to the commencement of our study, stakeholders involved in the management of the biodiversity offset scheme in NSW had observed that participation of individual landholders (e.g. farmers and rural-residential landholders) was poor in comparison to entrepreneurial, religious and public landholders. We, therefore, ask: *what are the enablers to entrepreneurial, religious and public landholders’ participation and the barriers to individual landholders’ participation?* Our goal is to develop insights into how barriers to individual landholder participation might be lowered or removed altogether. As mentioned above, equity dimensions of biodiversity offsets beyond societal equity outcomes have been understudied. We address this research gap by providing empirical evidence on factors explaining inequity in landholders’ access to biodiversity offsets. In addition, most of the biodiversity offsets and PES research focusing on equity has been carried out in developing country contexts. We make a further contribution to knowledge by providing insights into equity in access to biodiversity offset schemes in a developed country context.

2. Context and equity framework

2.1. The NSW context

To date, NSW has known two offsetting schemes. Established in 2006, the main objective of the first scheme, the Biodiversity Banking and Offsets Scheme (BioBanking), was to develop a systematic process to determine offsets, avoiding previous ‘ad hoc’ offsetting practices. Indeed, before Biobanking was established, developers were required to prepare a Species Impact Statement as part of the development application process. If the authority in charge of the development decision found it necessary to offset, the offset would then be negotiated between the

developer and the authority. This ‘ad hoc’ process meant that there was no consistent rule around the methodology used to assess biodiversity impacts and the measures necessary to restore habitats. BioBanking was therefore an attempt to make this process more systematic. However, it was not widely adopted by developers, as it was not compulsory and not applicable to all types of development, including major developments (Williams 2016; Dupont 2017).

In addition to BioBanking, several other offset schemes were developed in NSW under different legislation: (i) Property Vegetation Plans (2005) under the Native Vegetation Act 2003²; (ii) Biodiversity Certification (2010) under the Threatened Species Conservation Act 1995³; (iii) Biodiversity Offsets Policy for Major Projects (2014) under the Environmental Planning and Assessment Act 1979.⁴ As a result, many different processes existed for offsets, all using different methodologies. A review of the legislation in 2014 led to the establishment of the Biodiversity Conservation Act in 2016, which consolidated those many different processes by providing what is considered as a ‘transparent and peer-reviewed method for biodiversity assessment’ (Byron et al. 2014, p. 7). In the Biodiversity Conservation Act 2016, the use of biodiversity offsets – now called NSW Biodiversity Offsets Scheme (BOS) – became the only pathway for most developments, with their impacts assessed according to one consistent methodology, the Biodiversity Assessment Method.

The governance of the scheme is complex and has undergone modifications with the change in legislation. Under BioBanking, the main players were i) developers, ii) landholders, iii) consultants, iv) the Office of Environment and Heritage (OEH) – renamed Environment Energy and Science (EES) in 2019, v) the Greater Sydney Local Land Services (GSLLS), as well as v) brokers. Their roles were as follows:

- (i) Developers needing to buy offsets could either set up offset themselves or buy credits to landholders.
- (ii) Landholders wanting to generate and sell credits needed to confirm their eligibility, submit an expression of interest, get their land assessed using the Biodiversity Banking Assessment Methodology, enter into an agreement with the OEH, sell their credits to a developer, and start receiving annual payments for management actions.
- (iii) Consultants worked with developers and landholders to identify the number of credits they would need to purchase (developers) or they would generate (landholders) by using the Biodiversity Banking Assessment Method.

- (iv) OEH managed and administered the fund, by notably entering into contracts with landholders, managing the public register where developers and landholders could advertise the credits they needed to purchase (developers) or would like to sell (landholders), as well as the credit calculator, which provided information on the price of credits based on previous sales.
- (v) GSLLS, a government agency providing land management advice to landholders, played an informal role in BioBanking by talking about the scheme to the landholders they interact with and providing information to the agency managing the scheme about landholders’ perspectives on the scheme.
- (vi) Finally, brokers, who usually seemed to play that role in a relatively informal fashion, served as intermediaries between developers wanting to purchase credits and landholders wanting to sell theirs.

With the new legislation, the scheme and its governance have changed, the main changes being a name change from BioBanking to Biodiversity Offset Scheme (BOS), the introduction of a new key player, the Biodiversity Conservation Trust (BCT) and a changed role for OEH (now EES). Under BioBanking, OEH managed and administered the scheme; under the BOS, the BCT manages the scheme, while EES oversees its administration. BCT’s role is to (i) enter into agreements with landholders, (ii) source offsets for developers who can now pay the BCT to find offsets for them and (iii) pay landholders for their management actions through the Biodiversity Stewardship Payment Fund. The current role of EES is to manage the public register and the credit calculator.

In this paper, our primary focus is on the offset supply side (i.e. the landholders). Five main categories of landholders have been identified: i) public institutions; ii) companies offsetting their own developments; iii) religious congregations; iv) entrepreneurial landholders and v) individual landholders (e.g. farmers, rural living landholders).⁵ Under BioBanking, the first four types of landholders represented the majority of participants, while individual landholders were underrepresented. After the reform, the NSW Biodiversity Offset Scheme became primarily attractive to public landholders (e.g. Councils). This seems to be in large part due to the changed assessment methodology, mentioned earlier. Under the new methodology, the number of credits generated on a property has decreased. However, credit prices as estimated by EES’s credit price calculator are based on price trends under the

previous methodology. Consequently, many landholders did not deem participation in the scheme to be economically viable whilst participation rates of public landholders increased. The surge of public landholder participation can be explained as follows. The financial structure of the scheme has two parts: part A and part B. Part A represents the *management*, that is, money the landholder will receive in perpetuity to improve the state of biodiversity on his/her land. Part B represents the *profit*, which is a one-off lump sum payment, in addition to Part A, reflecting the opportunity cost. As the number of credits generated per hectare diminished, in many cases, credit prices seemed to often only cover the Part A and no profit (Part B) was made. This rendered the scheme primarily attractive for public landholders (e.g. Councils), as they mostly seek funding to cover management costs rather than make a profit.

Our case study research in NSW was conducted against a background of a changing legislative context. This change mainly affected the profitability of the scheme – the number of credits generated per hectare dropped under the new scheme. As this challenge could be overcome by recalculating credit prices, and considering that our perspective goes beyond profitability as the only determinant of participation, we did not make the one-off effects of legislative change our object of analysis. Instead, we address the many other factors (e.g. land size, access to information, knowledge and networks) that may directly or indirectly influence landholder access to the scheme. The methodology adopted for this research will be presented in [Section 3.1](#).

As most of our interviewees engaged with BioBanking rather than the BOS⁶, and because the BOS is still colloquially referred to as ‘biobanking’, we will refer to biodiversity offsetting in NSW as ‘biobanking’ or ‘the biobanking scheme’ in the remainder of the text.

2.2 The equity framework

This section looks at how the literature on biodiversity offsets and PES addresses equity. We will first define the dimensions of equity as identified in the literature and discuss how they can be used to analyse the design and implementation of a biodiversity offset scheme. Secondly, we will present the contextual factors that have been impacting the equity of PES.

As mentioned in the Introduction, equity has not yet been fully addressed by the biodiversity offset literature. Indeed, only a few publications tackle this question (BenDor et al. 2008; Bidaud et al. 2017; Griffiths et al. 2019a, 2019b). Moreover, these studies

mostly focus on the distribution of outcomes from biodiversity offsets – that is, who gets the benefits and who bears the burden of the implementation of biodiversity offsets. In contrast to biodiversity offsets, PES practitioners and researchers have been observing and evaluating the diverse equity dimensions of PES (Porrás 2010; Sommerville et al. 2010; McDermott et al. 2013; Narloch et al. 2013; Hejnowicz et al. 2014; Pascual et al. 2014).

Three equity dimensions have been identified and conceptualised in the PES literature (McDermott et al. 2013; Pascual et al. 2014; Friedman et al. 2018). These have a role to play in the design of a scheme, its implementation, its management and evaluation of its outcomes:

- (i) Procedural equity - the inclusion of all stakeholders in the political process leading to the allocation of resources. For biodiversity offsetting or PES, this would be about how stakeholders are being involved in the design of the scheme and consulted on an ongoing basis regarding its implementation and management.
- (ii) Recognition equity - how the scheme accounts for the diverse knowledge, values and norms of stakeholders. The focus would be on the degree to which different forms of knowledge and values are integrated into the design of the scheme, as well as its implementation and management, notably in terms of determining the objectives of the scheme and its rules.
- (iii) Distributive equity - the allocation of costs and benefits from the scheme. For biodiversity offsetting or PES, this could refer to implementation and management, specifically landholders’ ability to participate in the scheme, as well as its outcomes. Outcomes derive from the scheme’s impacts on its participants as well as on the broader population. The focus could be on the distribution of the financial benefits as well as the human and social benefits of the scheme.

The literature identifies a fourth dimension of equity – contextual equity – as underpinning the three above dimensions. Contextual equity refers to the existing political, social, cultural and historical context in which biodiversity offsetting or PES are implemented. It examines how existing asymmetries in terms of wealth and power create an uneven playing field for the potential participants in a scheme.

According to Friedman et al. (2018), distributive equity was the dimension most observed in empirical studies, addressing questions of access to the PES scheme and its outcomes (e.g. financial resources,

livelihoods and well-being). In contrast, procedural and recognitional equity were less studied. Most of those studies (76%) found that conservation measures were often leading to negative or mixed equity outcomes (all types of equity taken together), while a minority (13%) was leading to positive outcomes.

While Friedman et al. (2018) argue that contextual equity was providing background rather than a focus of analysis, we found that many published studies (Zbinden and Lee 2005; Corbera et al. 2007, 2009; Pagiola 2008; Muradian et al. 2010; Porras 2010; García-Amado et al. 2011; Garbach et al. 2012; Mahanty et al. 2013; Bremer et al. 2014; Haas et al. 2019) identified elements of contextual equity that influenced landholders' ability to participate and/or benefit from PES schemes. Two factors were often observed as playing an important role in landholders' ability to participate in PES schemes: i) land tenure/rights; and ii) size of the land. Indeed, individuals who do not hold formal rights or title on land are often unable to participate or derive full financial benefits (Pagiola 2008; Corbera et al. 2009; García-Amado et al. 2011; Haas et al. 2019). In other cases, it has been shown that larger landowners and private companies were often benefitting from PES, while smaller landholders had more difficulty accessing the scheme (Zbinden and Lee 2005; Muradian et al. 2010; Porras 2010; Bremer et al. 2014). Other factors such as wealth, education, gender, ethnicity, social status/standing, as well as negotiating skills have often been identified as influencing PES participation (Mahanty et al. 2013; Haas et al. 2019). In addition, potential participants' access to

the scheme is also determined by their ability to access information, knowledge and networks (Corbera et al. 2007; Garbach et al. 2012).

Our study focuses on the question of access to participation of landholders in the biobanking scheme. This question relates to the distributive equity of the scheme, as well as to the broader contextual equity components that may influence distributive equity (see Figure 1).

3. Methods

3.1. Case study

This project employed a case study of the biobanking scheme. The case study focused specifically on the Greater Sydney Metropolitan area, as nearly half of the BioBanking agreements (84 of 179, or 47%) are in this area (see Figure 2). This is likely to continue in the future as most of the planned development in NSW is for the Greater Metropolitan Sydney area.

The case study addresses six local government areas (LGAs): the Wollondilly Shire Council, Penrith City Council, The Hills Shire Council, Camden Council, Campbelltown City Council and the Hawkesbury City Council. These areas represent a range of situations within the Greater Sydney area (see Figure 3). While Campbelltown and Penrith are largely developed local government areas close to Sydney, Camden, Wollondilly and The Hills Shires are situated further away from Sydney and still have extensive bushlands while being under pressure for development. Finally, the Hawkesbury represents the

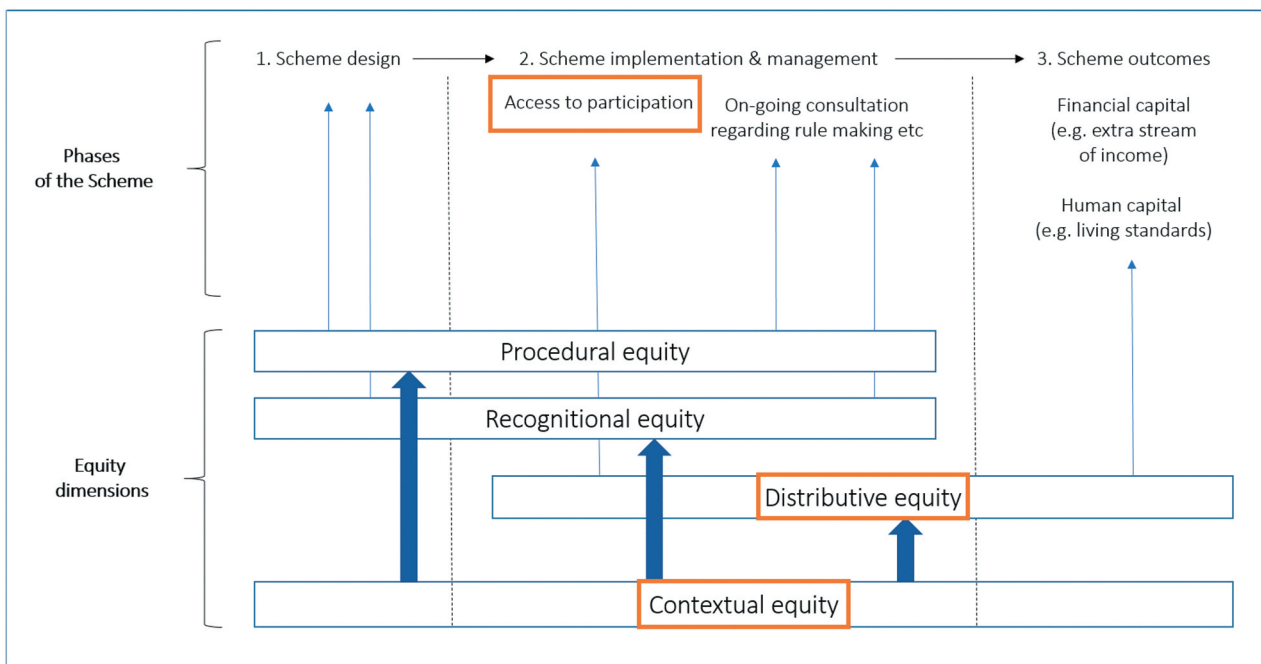


Figure 1. Equity dimensions for consideration during three phases of a scheme – design, implementation & management and outcomes. The phases of the scheme and equity dimensions we will focus on in this paper are in orange.

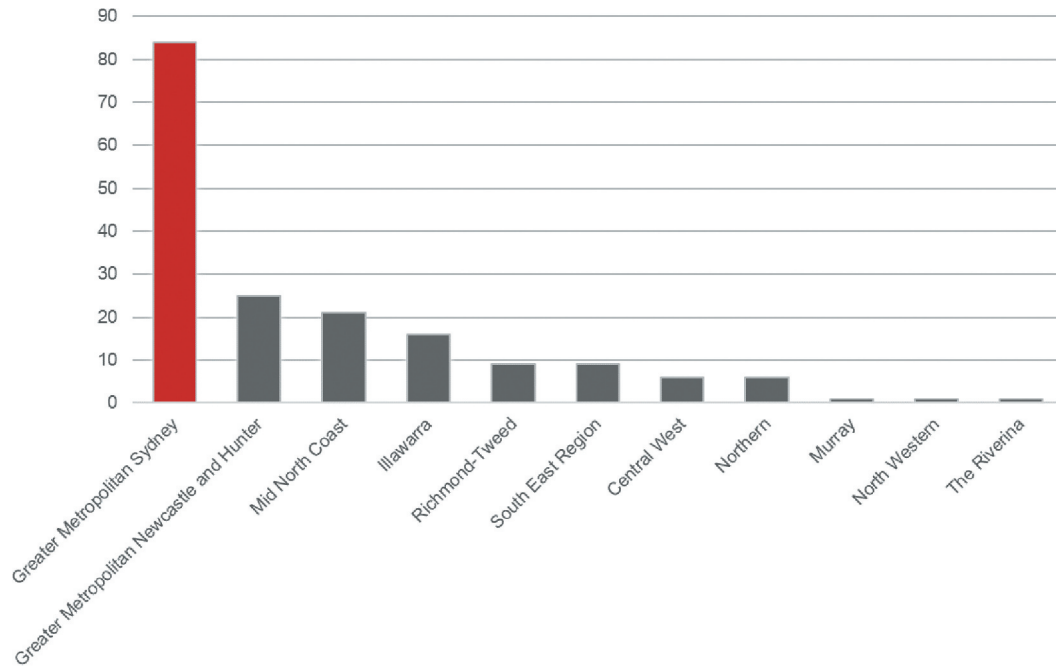


Figure 2. BioBanking agreements per region between May 2010 and May 2019.

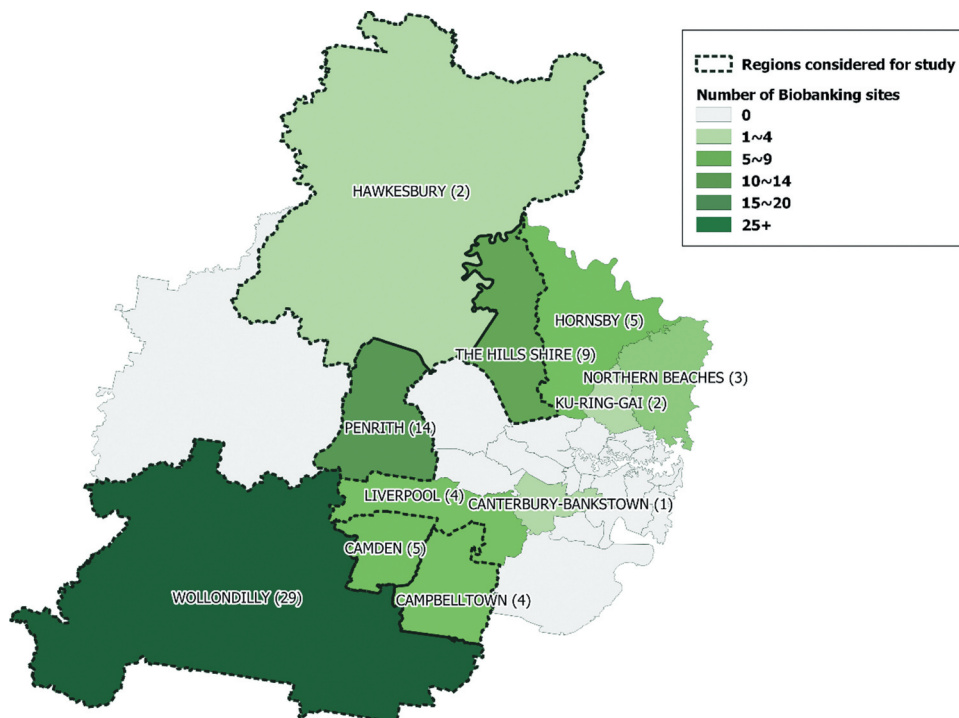


Figure 3. BioBanking agreements in the Greater Metropolitan Sydney area between May 2010 and May 2019 and Council areas considered in our study.

other end of the spectrum, with an area that is largely preserved and encounters less development pressures. Our selected LGAs also represent different degrees of participation in the scheme, with Wollondilly, Penrith and The Hills participating actively (29, 14 and 9 contracts, respectively), while Camden, Campbelltown and Hawkesbury's participation is minimal (5, 4 and 2 contracts).

3.2. Data collection and analysis

A total of 30 interviews were conducted: 24 interviews on 24 properties with 34 landholders (both participants and non-participants in the biobanking scheme) and six interviews with staff from local and state governments, a representative of an environmental association (Landcare) and consultants working with suppliers and buyers of offsets. In

this paper, we will mostly focus on the landholder interviews and only marginally draw on the six interviews with other stakeholders. This is why we will only describe the recruitment process in regard to landholders. To recruit landholders, we contacted agencies, organisations and associations that work with landholders, such as the Wollondilly Shire Council, the Greater Sydney Local Land Services, the Razorback Environment Protection Society, the Greater Sydney Landcare, the Menangle Fox Control Group and the MacDonald Valley association. Staff members or volunteers in those agencies/organisations/associations shared a summary of our research with their members through emails or Facebook advertisement. We also publicised our project in two local newspapers in the Camden and Wollondilly area: Camden Advertiser and Wollondilly Advertiser. We then employed snowball sampling to recruit additional participants. Table 1 summarises the characteristics of the landholders interviewed. Prior to the interview, participants were given a consent form. Each participant agreed to the terms and signed the consent form.

Regarding the degree of awareness of the scheme, the landholders interviewed were situated on a broad spectrum from no awareness of offsets and of the scheme to being participants in the biobanking scheme (see Figure 4).

Interviews were carried out face-to-face, usually on the landholder's property, and sometimes in a public place of their choice. Interviews lasted 60 to 90 minutes on average and were all recorded and transcribed verbatim. The interviews were semi-directed, and structured around three main sections: 1. Characteristics of the landholder/institution and the land; 2. Landholders' experiences with and perspectives on the scheme⁶; and 3. Factors influencing decision-making regarding private land conservation (see Appendix A). The interview transcripts were systematically analysed using the NVivo software. Initial thematic coding was used in order to inductively identify themes of importance. Emerging themes were then grouped in broader categories identified deductively from literature.

4. Results

This section presents the 'contextual' factors suggesting distributive inequity among landholders in terms of access to the scheme. We first present the factors that enable entrepreneurs, public landholders, religious communities and a few farmers (i.e. graziers) to participate in the scheme. We will then present the factors that prevent or discourage individual landholders (e.g. farmers and rural-residential landholders) to participate.

Table 1. Characteristics of the landholders interviewed.

Characteristics	Participants in the biobanking scheme	Non-participants in the biobanking scheme
Types of properties	2 religious congregations 2 public landholders 2 entrepreneurs 3 graziers 1 rural-residential landholder*	9 rural-residential landholders 2 farmers – horticulture 2 hobby farmers
Proportion of land under BioBanking (participants)/Property size (non-participants)	23 hectares to several hundred**	From 2 to 100 hectares
Age of landholders	29 to 68 years	2 interviewees were in their 50s 18 interviewees were over 60
Location	Wollondilly Shire City of Penrith Camden Shire City of Campbelltown Sydney basin and regional NSW	Wollondilly Shire The Hills Shire City of Penrith City of Hawkesbury

*Bought a property that was already under BioBanking.

**One participant owns several properties.

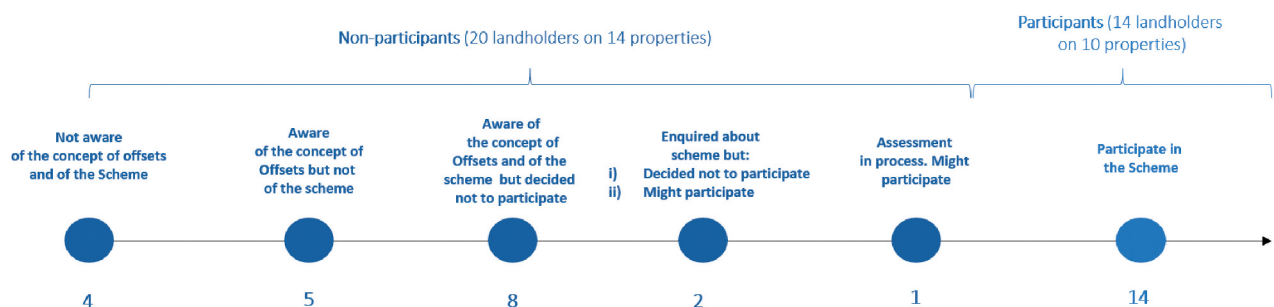


Figure 4. Interviewees' position on the spectrum going from non-participation to participation.

4.1. Contextual factors enabling participation in the scheme

Participants in the biobanking scheme often did so because they: i) were able to develop a good understanding of the scheme; ii) were able to identify whether the scheme was relevant to their property; iii) had the resources to go through the assessment process; iv) knew that they would be able to sell their credits; and v) were confident they could comply with the technical requirements of the scheme. As a result, the scheme often emerged as a low-risk endeavour with the potential to bring benefits. This point is illustrated by a landholder who commented that ‘the risk-reward of the business, it made sense. The risk was low, the potential rewards were good. So, that sounded good to me.’

The contextual factors that explain their low-risk perception are: i) experience; ii) resources; and iii) access to information and support through formal and informal networks. While participant landholders did not necessarily benefit from all those contextual factors. They often benefitted from one or several of them.

When relating their experience of entering into the scheme, several participants, mainly public landholders and entrepreneurs, showed how their previous experience with the scheme (or offsets more generally), as well as their ability to independently source relevant information, enabled them to develop a good understanding of the functioning of the scheme. For example, one staff member of a Council participating in the scheme explained that his previous position in an environmental management company led him to be involved in the development of several biobanking sites and to develop ‘a bit of understanding about how it sort of worked’. Another landholder, an entrepreneur with a long business experience and involvement in environmental management, explained how he consulted ‘primary’ data on the biobanking scheme, such as the legislation and the BioBanking register – where supply and demand for credits are displayed – to understand whether there would be demand for the scheme:

I just looked up the legislation and just ferreted through the sites, looked at the BioBanking register. There had been sales made. The legislation was obviously leading to demand because there were infrastructure projects coming and developers had the opportunity to participate in the scheme rather than using the species impact statements.

In addition to experience, several participants explained that they had access to financial and staff resources. Access to these resources often enabled them to start the process of entering the scheme by paying for the ecological assessment of their land,⁷ as well as to negotiate the conditions of their participation in the scheme. One Council staff member explains that the Council had the financial resources

to pay a consultant to carry out the assessment of their land. Their good understanding of the scheme also led them to develop certainty about the financial viability of the Scheme: ‘We knew that we were going to generate a significant amount of money from it. So, it [assessment costs] was something that we could just cover through internal budgets to make that happen.’ The availability of skilled staff resources, such as lawyers and property managers, provided support to several types of participants, such as public landholders and religious congregations. Indeed, while a Council staff member explained that the lawyers and property managers of the Council provided advice about credit prices, a representative of a religious community explained that some of their staff provided support during the application process. This participant contrasts the position of her community with the position of individual landholders (i.e. the ‘Joe Bloke’ referred to in the quote below), stressing that the latter do not necessarily have the resources to go through this process:

We spent a lot of money on our staff that were highly skilled and highly paid staff, really. One was a lawyer, spent a lot of time down here or negotiating with the Office of Environment and Heritage. Now we endorsed that, because we said, ‘That’s our commitment’, but it’s a very costly thing and I think if you were ‘Joe Bloke’ down the road and you didn’t have a strong commitment to it or you didn’t have resources, negotiating that can be difficult.

A third, essential contextual factor that explains the ability of entrepreneurs, public landholders, religious congregations and some graziers to participate in the scheme is their ability to access information and support through formal and informal networks. Several participants stressed the importance of support (technical and financial) and information received through formal networks, that is, staff members from government agencies. One Council staff member explained that when the Council was working on its application, the Office of Environment and Heritage (OEH), which was managing the scheme at the time, was in the process of ‘contacting all the councils with all the relevant information and holding forums and stuff. That was quite easy for us to be able to get up to speed with what was required’. Another participant, the representative of a religious community, explained that he received information and technical/financial support from an OEH liaison officer who carried out the assessment of the land.⁸ For him, it was this initial support that enabled his community to make a decision regarding participation:

When I first met the people from the OEH who came out for a preliminary survey, that went on to become a lot clearer what was involved, and they were most helpful. [...] It was that contact that helped us to decide.

In addition to information and support received through formal social networks, many participants stressed the importance of their more informal social networks for the provision of information and support around the scheme. For example, one entrepreneurial landholder⁹, who works in an environmental management company, stated that receiving information from a colleague and acquaintances who are directly involved in the scheme, was crucial for him to develop a good understanding of the scheme:

If me as an individual heard about biobanking, getting all the information myself, I think [it] would be a lot more challenging than what it is now that I've sort of come into this company and I learn off [name of the colleague] and I learn off [name of the acquaintance] about the whole, you know, aspect of biobanking.

For another participant, one of the graziers participating in the scheme, informal social networks provided reassurance regarding one's ability to meet the scheme's requirements. This grazier had several friends who participate in the scheme. As a result, seeing them managing their land to meet the Scheme's requirements provided him with the confidence that he would be able to do the same: 'I think I knew enough people who'd done it to know that they'd got through all of that [management of the land] without too much concern.'

Beyond opportunities for sharing information and experience, formal and informal networks also provide direct support to potential participants, notably through providing 'brokering' services between suppliers and buyers of credits. In the case of one grazier participating in the scheme, it was the consultant in charge of the assessment who identified a developer willing to purchase the credits generated on the land. In other cases, it is landholders participating in the scheme who identify potential buyers for landholders. Two participants explain that one of their friends, an entrepreneurial landholder with multiple bio-banked properties, has connections with developers, enabling this individual to bundle credits together and sell them to developers. Finally, one grazier explains that he did not raise buyer interest in offsets from his land when he put an expression of interest on the OEH credit register, but was able to sell his credits when a friend participating in the scheme put him in direct contact with a developer looking to offset its impact:

We didn't actually own credits, but we were able to show that there was a potential of credits on the website. I can't remember again exactly when that was. We did that but then nothing really happened. No one showed any great interest until about 2016 and then that was actually through [landholder's name], had been approached by a company called [name of the company], developers: 'We're looking for more credits'. And they gave us the impetus.

4.2. Factors preventing participation in the scheme

Interviewees not participating in the scheme are mostly farmers and rural-residential landholders. In contrast with participants, non-participants perceive the scheme as a risky endeavour. The non-participants interviewed identified many areas of uncertainties.

A few non-participants expressed uncertainty around the number of credits that would be generated on their land and the financial benefit they would derive from the scheme. Those landholders were particularly interested in understanding whether the biobanking benefits would match the opportunity cost of not developing the land for residential purposes:

What I'm trying to do is to find out: is it commercially viable for me to look at bio banking? [...] I haven't come to a conclusion yet. [...] See, the land is worth millions, to subdivide. [...] So, the biodiversity has got to match, not necessarily a match, but give me an income that I can live well on.

A second concern of non-participants is their ability to meet the scheme's requirements in terms of land management. Two interviewees were particularly concerned about the emergence of new weeds and the impact these could have on their ability to meet the management requirements (see Cooke and Corbo-Perkins 2018 for similar findings). To illustrate this point, one interviewee offers:

How do they know how much it's going to cost to do that? What if you run out of money? [...] The variable here is the additional weeds coming from outside. As I said, 10 years ago we didn't have Chilean Needle Grass. We didn't have African Lovegrass. A part of that scheme is they don't want that on this property. That's extremely difficult to control.

Finally, many non-participants were planning to eventually downsize and sell their property. They, therefore, had questions on how biobanking would impact their ability to sell their land. Some landholders could be facing financial hardship if they were unable to sell their property.

The lack of certainty around several dimensions of the scheme and its subsequent perception as a risky endeavour can be partially explained by non-participants' experience with the scheme. The two non-participants who enquired about the scheme and the landholder whose property was in the process of being assessed at the time of interview did not benefit from the various resources (i.e. experience, resources and access to information and support through formal and informal networks) available to the participating landholders. Rather, they mostly consulted the online information made available by the agencies managing

the scheme. They often described this information as ‘inconclusive’, ‘confusing’ and ‘piecemeal’. Out of the three landholders, one contacted a consultant and rapidly found that his property was too small to be viable, while another hesitated to pay for an initial assessment of his property at the time of the interview. The third one went ahead and paid for a preliminary assessment of his property. However, in addition to online information, the third landholder benefited from the visit of a GSLLS liaison officer who provided him with information on the scheme and advised him that he considered his land as suitable for the scheme:

A fellow [...] came out to the property from Local Land Services. [...] He spent about three hours here - lovely guy - and explained a lot, and thought it was quite suitable for biobanking, and he identified Cumberland Plain Land Snails on the property, which is an endangered species.

When asked if he would have been more wary of continuing to explore biobanking further had the GSLLS liaison officer not come to his property, this landholder offered: ‘I don’t know where I would’ve gone next. I was basically just stumbling around, so [...] he was able to verify what I was suspecting, that it might be worthwhile.’ We can therefore see that the provision of information in the form of a property visit by a liaison officer was of importance to this landholder. In addition, many non-participants said that the upfront assessment costs (\$AUD 20,000–30,000) were a major hindrance to their participation.

Besides experience, resources and access to information, another contextual factor plays an important role in hindering participation: land size. A consultant interviewed explained that although the scheme does not have minimal land size requirements, in practice high assessment and administrative cost outweigh income from offsets on small properties. Still according to this consultant, while those costs can represent 25% of the total management costs for a small landholder, they can drop to 5% for larger land sizes. As a result, the scheme is more attractive to participants able to achieve economies of scale by putting large tracts of land under biobanking agreements. This means that currently the scheme is not accessible to smaller landholders. The minimum lot size to make the scheme viable depended on the area and relevant credit price in that area. According to a consultant interviewed, the minimum lot size for Western Sydney, where many of our interviewees lived, is 15–20 hectares. While all participating landholders were able to put more than 20 hectares of land under biobanking, many non-participants reside on relatively small properties, some as small as two hectares.

4.3. Synthesis of findings

Our findings show that several ‘contextual’ factors cause distributive inequity in access to biobanking

in NSW. Participants were, before joining, often able to develop a better understanding of the scheme and a stronger confidence in their ability to participate. Factors at play included their experience/expertise, their resources (financial, skilled staff), their ability to access information and support through formal and informal social networks, and the size of their land. In contrast, non-participants failed to develop sufficient understanding of the scheme or resolve their doubts about its suitability for their specific property and situation more generally. Non-participants who enquired about the scheme had mostly consulted online information, which did not provide sufficient certainty about their ability to participate. They did not have prior experience with the scheme or the support of a formal or informal network. Additionally, they often do not have the financial resources to pay for the ecological assessment and are often living on land that might be too small to make it a viable endeavour. Those circumstances often discouraged them from engaging further in the scheme.

We observe that landholders who successfully go through the process often receive additional information and support to what is normally provided. At the initial stage of information gathering, participants had access to individualised information and support. At the assessment stage, those who may not have had the financial resources necessary to pay for a consultant received financial support for the assessment. Finally, at the credit sale stage, participants had access to informal networks that played a brokering role and enabled them to sell their credits (see Figure 5).

5. Discussion

We have identified the factors enabling some landholders to participate in the scheme while preventing others to do so. This section explores what non-participants in the biobanking scheme would need to be able to participate and provides recommendations for improving the equity in access to the biobanking scheme in NSW and biodiversity offsets more generally. We also reflect on equity in access to biodiversity offsets in a developed country context.

5.1. What non-participants would need to participate in the scheme

Participants in the biobanking scheme had expertise and access to resources, information, support. These were not available to non-participating landholders. While non-participants confirmed the importance of access to individualised information and support through formal and informal networks, as well as the need for financial support for the ecological assessment of the land, they also put strong emphasis

The landholder...

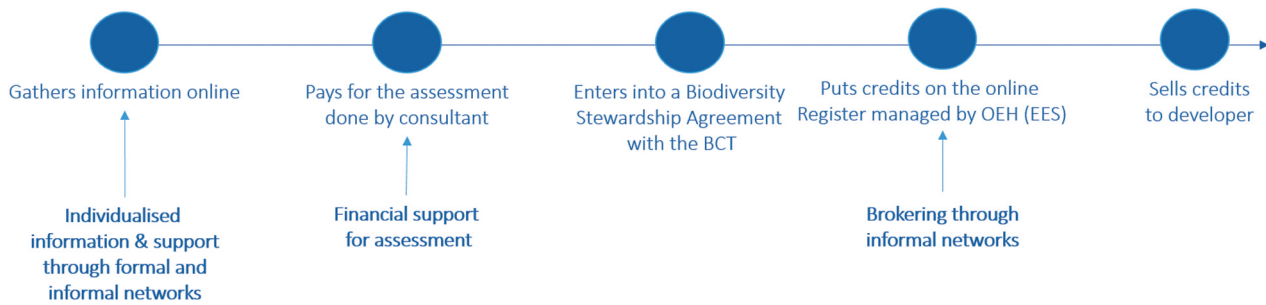


Figure 5. Factors that enable participants in the scheme to go through each step of the process – ‘normal’ process is described on each dot, and the additional support received by participating landholders is described under the arrows.

on a notion that remained relatively implicit in participants’ responses: social networks and trust. This justifies a brief exploration of how social networks and trust are considered as essential by non-participants.

Other research on landholder participation in private land conservation programs has shown that social capital, particularly social networks and trust, is often an enabler (Garbach et al. 2012; Bremer et al. 2014; Lastra-Bravo et al. 2015; Taylor and Van Grieken 2015). Social capital refers to the relationships within or between social groups that enable collaboration. It has three components: social networks, trust and social norms (Bourdieu 1986; Coleman 1990; Putnam 1993). Social networks refer to the formal and informal connections within and between social groups. Three types of social networks have been identified: bonding, bridging and linking networks (Woolcock 1998; Putnam 2000). Bonding refers to ties within a social group, bridging to the connections between different social groups and linking to the connections between social groups with different levels of power and authority. Regarding trust, two types of trust have been identified: social trust, that is the trust developed between members of the same social group; and institutional trust, that is the trust of individuals in government or political parties for example (Jones et al. 2009). Finally, norms refer to the rules that govern the behaviours of members of a social group.

Non-participants explained that the presence of bridging social networks, as well as institutional trust would be essential for them to consider participating in biodiversity offsets. Many of them explained that they would like to receive individual face-to-face advice on their property in the form of a visiting liaison officer. This could be considered as a ‘pre-assessment’ that would help landholders understand whether their property is suitable for the scheme, avoiding early misinterpretation. Currently, such pre-assessments do exist, but they are done by consultants, and even though they are considered as relatively low-cost, the fees charged may still be prohibitive for some landholders, particularly if the

uncertainty regarding the scheme is high. This insight is in line with some of the literature on landholder participation in conservation programs. For example, Moore and Renton (2002, 2011) observed that landholders are often more responsive to site-specific information provided through one-on-one interactions with a qualified individual. When asked who those ‘liaison officers’ should be, certain non-participants referred to their existing networks, notably liaison officers from GSLLS who they consider trustworthy. Trust was built through the development of an ongoing and long-lasting relationship, and through GSLLS liaison officers showcasing dependability through long-term involvement in the area, as well as competence: ‘She’s been working with the valley for 20 years or something and I completely trust her and she’s incredibly practical and sensible.’ While no consistent definition of the components of trust exists, elements such as dependability, competence and care have been identified as important (Fisher 2013). Other non-participants also explained how GSLLS liaison officers were providing them with direct support, by helping them filling grant applications for example. These findings are in agreement with some of the literature on landholder participation showing that support from extension officers, technical advisers or government institutions, as well as the trust developed by landholders in representatives of those institutions (i.e. bridging social capital), can explain landholder participation rates (Mettepenningen et al. 2011; Morrison et al. 2011; Cooke et al. 2012; Lastra-Bravo et al. 2015). Other non-participants, without existing social networks for biodiversity management, also expressed the need to be provided with face-to-face advice on their property. However, they did not nominate specific entities they would prefer to receive the information from.

Non-participants also mentioned the importance of bonding social capital, through interactions with landholders participating in the scheme. One interviewee explains that visiting properties that are already participating in the scheme would enable landholders to get ‘a better sense of if it’s doable, or it’ possible. Otherwise, it’s

just theoretical. [...] By talking to people where it does work, you believe it more'. Bonding social capital has also been shown as important as relationships with other landholders enable landholders to i) obtain information, ii) observe their practices and discuss management decisions and iii) gain insights on their perspective on the program (Cooke et al. 2012; Garbach et al. 2012; Lastra-Bravo et al. 2015).

5.2. Recommendations for New South Wales and elsewhere

Our findings suggest that equity in access to the biobanking scheme and other similar schemes could be improved in several ways.

Firstly, it is essential for potential participants to be able to get a 'pre-assessment' of their property in the form of the visit of a qualified liaison officer. A pre-assessment could be carried out by liaison officers or technical advisors from local government agencies (e.g. GSLLS) who have already existing networks at the local scale and are trusted by landholders. Another possibility would be for the responsible government agency to engage in trust-building activities with landholders. This might be particularly relevant for landholders who do not belong to existing networks.

Secondly, financial support for the ecological assessment costs could be contemplated. For example, the costs could be borne by other stakeholders involved in the scheme, such as the developers or the government agency managing the scheme. The costs could be deducted from credit sale. To do so, the landholder would need to commit to participation before the assessment is carried out. This reinforces the need for the landholder to have a good understanding of the scheme and its feasibility on his/her property before assessment. It is therefore of paramount importance that landholders have capacity to develop their understanding of the scheme through information and support provided by formal and informal networks beforehand. This could, for example, be achieved through landholder groups, where non-participating landholders would visit the properties of participating landholders.

Thirdly, the importance of brokering services should be acknowledged. Participating landholders explained that their ability to identify a buyer was often made possible through brokering. A more transparent brokering system where brokers are clearly identified and can be accessed by all landholders would potentially lead to a more equitable system. However, brokering services fees would remain and this could lead to new inequities where such fees would be prohibitive for some landholders. The current situation of the biobanking scheme could see an improvement in this regard as the Biodiversity Conservation Trust (BCT), the new government agency in charge of managing the scheme, is increasingly using biodiversity credit tenders and fixed-

price offers to sell biodiversity credits. With these efforts, the BCT effectively assumes the role of a broker between buyers and sellers of biodiversity credits. This brokering could enable landholders who do not benefit from the informal brokering system in existence, to still access the market and sell their credits without incurring proportionally prohibitive initial costs.

Elements of the three recommendations above, notably the call for more collaboration between liaison officers and potential scheme participants or between potential participants and landholders already participating in the scheme, challenge an important aspect of the biobanking scheme: competition between participants in the market. While we acknowledge that there may be tension between collaboration and competition, we believe that three arguments land in favour of promoting more and better collaboration.

The first argument has already been developed at length earlier, i.e. that participants in the scheme were able to benefit from collaborative relationships to enter the scheme, and that non-participants do not have access to these relationships. This goes to show that participation in the scheme is already exhibiting a hybrid of competition and collaboration, but that not all landholders benefit from collaboration. Enhancing the collaborative dimension of the scheme, for example, through pre-assessment and landholder groups, would redress this imbalance by providing opportunities for collaboration to all.

The second argument in favour of the enhancement of collaboration in the scheme is that in order to be effective, conservation efforts need to be undertaken at the landscape-scale (Opdam 2014; Cooke and Moon 2015). As a result, it is therefore important to encourage participants to communicate and share knowledge with other participants beyond the boundaries of their properties. Even though the landholders involved in the scheme might not be neighbours at this point in time, fostering collaboration between landholders can be important in the long term as it could lead to better cross-boundary management once more adjoining properties participate. In sum, collaboration might foster both 'ecologies of scale' and 'economies of scale', reflecting potentially non-linear gains from collaboration in terms of biodiversity outcomes (through enhanced ecological connectivity at the landscape scale) as well as costs (through, e.g. shared resources for ecological management and restoration as will be suggested below).

Finally, public agencies normatively set the rules that are expected to lead to positive ecological outcomes, as well as positive social and equity outcomes, even though these have been less of a priority or focus. As a result, it would be expected that public agencies intervene to foster a balance between competition and collaboration, in order to reach more positive ecological outcomes (i.e. better conservation across property boundaries) and social and equity outcomes (i.e. improved landholder

access to the scheme). Indeed, the above argument of ecologies and economies of scale would apply here as well.

Our fourth and last recommendation relates to small landholdings. In our study, non-participants often hold smaller lands. Facilitating small landholders' participation might therefore contribute to enabling the participation of non-participant landholders. The main barrier to small landholders' participation is the costs associated with ecological assessments, as mentioned earlier, but the administration and management costs (administration costs are part of the management costs in the form of Part A payment⁹) also pose barriers. According to a consultant interviewed, administration costs are uniform across property size. For small landholders, who might generate a limited amount of credits, the administration costs can represent a high proportion of the Part A payment, not yielding enough money for the costs related to actual land management. As such, the scheme is financially non-viable for small landholders. A first step towards facilitating smaller landholders' participation could be to make the administration costs (e.g. annual reporting, annual compliance fees, etc.) proportional to land size. A second step could be to minimise costs associated with the management of the land. This could be done by encouraging the collective management of land for smaller properties, creating economies of scale and diminishing costs. While conservation programs, such as agri-environmental schemes (Franks and McGloin 2007; Prager et al. 2012) encourage collective applications and management of land by landholders, collective applications may not be possible for the biobanking scheme due to legal difficulties (the agreement is tied to the land title). However, adjoining neighbours wanting to individually apply to the scheme could agree to handle the land management collectively and share the costs. These two steps would lead to diminished administration and management costs for individual landholders, increasing the likelihood of making applying to the scheme financially viable for those smaller landholders. We could consider that encouraging the participation of smaller landholders is of no importance as they would only generate limited positive ecological outcomes. However, it could be argued that engaging with those smaller landholders could have some positive equity outcomes. We will discuss the importance of considering equity outcomes and striking a balance between ecological and equity outcomes in the next section.

5.3. Does equity in access to biodiversity offsets matter in a developed country context?

Most of the literature on equity in biodiversity offsets or PES focuses on developing countries. In a developing country context, PES are often considered as beneficial for social and economic development of the poorer and/

or more marginalised constituents of society. As a result, in addition to environmental goals, PES aim to alleviate poverty, reinforce the rights of local and indigenous people and/or promote rural development. The conception of distributive justice adopted by those PES is based on need. That is, the schemes aim at rewarding the individuals that need it the most. In the Greater Sydney Metropolitan area, as in many developed country contexts, landholder poverty and marginalisation are relative. As such, does social equity matter? Or should the focus be solely on ecological outcomes? This leads us to ask two sub-questions: i) What type of social equity could matter in the Greater Sydney Metropolitan area context? ii) Should there be a hierarchy between ecological and equity outcomes?

There are four grounds on which to consider the importance of social equity: i) egalitarianism, ii) need; iii) merit and iv) common good (McDermott et al. 2013). We briefly consider how each argument might apply in the Australian context. If we follow the principle of 'egalitarianism', or equality in the distribution of benefits, it could be argued that every landholder should have a 'fair go' at accessing the scheme. The 'fair go' represents a deeply ingrained Australian societal value. For small landholders who are currently excluded from the NSW scheme, such as farmers and rural-residential landholders, other equity-related arguments emerge. When considering farmers, the economic viability of farming operations is progressively degrading, threatening farmers' livelihoods. Consequently, biodiversity offsets can be considered as a mechanism enabling them to derive another stream of income and to remain on their land. Here, we can see the 'need-based' argument re-emerge. Indeed, farmers would potentially be the ones needing to benefit from the scheme, as their livelihood is most immediately threatened. There also exists a 'common good' argument regarding the ability of agricultural producers to participate in the scheme, as maintaining agricultural production in proximity to cities has the potential to contribute to the greater good through, for example, provision of fresh food, maintenance of landscape quality. If we consider rural-residential landholders, we can argue that if those landholders want to undertake conservation work on their property, they will most likely need to do so with their own funds and with the occasional support of small grants. This was the case for many of the non-participant rural-residential landholders interviewed in this study. The landholders able to participate in the scheme have their management costs compensated, while non-participant rural-residential landholders, are to fund their own management cost. A merit-based argument (i.e. rewards should be proportional to inputs) could be developed here, and it could be argued that rural-residential landholders should be compensated in accordance with their level of input.

Clearly, the question of the need for equity in incentive-based conservation schemes prompts different considerations in developing and developed countries. However, even if poverty alleviation is deemed irrelevant in the context of biobanking in NSW, we can see that the need for *distributive justice* can be framed in different ways: i) promotion of *egalitarianism*, so that all landholders can have a fair go; ii) adoption of the *need-based* principle, which argues that farmers should be provided with an alternative income stream, as their livelihoods are threatened; iii) promotion of the *merit-based* principle, which argues that landholders should be compensated based on their inputs; and iv) the *common good* argument.

Once the type of equity that needs to be promoted is determined, the interactions between ecological and equity outcomes need to be scrutinised, and an understanding of the trade-offs between the two needs to be developed. The relationship between equity and ecological outcomes can be articulated around the following questions: Should ecological gains be the only criteria to consider for the implementation of a biodiversity offset scheme? Or should all landholders be able to participate in the biobanking scheme regardless of the ecological gains they provide?

At one end of the spectrum, it could be argued that the biobanking scheme should simply be efficient: generating the highest ecological outcomes at the lowest cost. If we adopt this vision of the scheme, it seems only logical that landholders providing high ecological outcomes will be able to participate, while landholders who can only provide low ecological outcomes will be excluded. At the other end of the spectrum, it could be argued that providing equitable outcomes (regardless of which type of equity is chosen) should be the main objective. This could lead, in contrast, to poor ecological outcomes and high administration costs for government agencies. Moreover, this vision would indeed defeat the purpose of most contemporary biodiversity policy formulations.

An intermediary position would suggest that while ecological outcomes are a priority for the biobanking scheme, and biodiversity offset schemes more generally, ensuring that the scheme has positive equity outcomes could be considered as a complementary benefit of the scheme. Therefore, we do not argue that equity should be the priority of the biobanking scheme, or that equity amounts to all landholders being able to participate regardless of the ecological value of their land. Rather, we offer that equity outcomes should not be dismissed in the design and operation of such schemes, and that in addition to determining normative rules regarding ecological outcomes (e.g. which natural habitats are considered equivalent), it is important for such schemes to also consider equity outcomes.

Considering equity outcomes implies determining whether it is important for the scheme to provide support to landholders who might be at a disadvantage. The reasons to provide support to those landholders might vary from scheme to scheme, depending on the type of equity sought (e.g. egalitarianism, need, merit or common good) and the types of landholders present in the geographical area to which the specific scheme applies. If the scheme is perceived as having potential to improve equity in a specific area, the next step is then to identify the potential trade-offs – or synergies – between ecological and equity outcomes and find thresholds at which both ecological and equity outcomes can be met. Those thresholds need to be determined at the time of designing the scheme and need to correspond to the values and expectations of the stakeholders that will take part in the scheme.

6. Conclusion

We have shown that biodiversity offsets in NSW are currently inequitable in terms of landholder access to the scheme. Landholders with more experience, resources and access to support and information through formal and informal networks and larger properties are able to participate, while landholders who do not benefit from such advantages are not. The latter category of landholders represents rural-residential landholders, and farmers often owning smaller properties. As biodiversity offsets are often presented as aiming to achieve the highest biodiversity outcomes at the lowest cost, it might not be seen as necessary to include landholders who might provide lower biodiversity outcomes at a potentially higher marginal cost (administration costs). While we do not argue that equity should necessarily prevail in biodiversity offsets (considering that biodiversity outcomes are the main policy objective), we offer that equity considerations should not be ignored in biodiversity offset policy, and that striking a balance between ecological and equity outcomes is necessary and, when done well, might enhance overall ecological, economic and social outcomes. A pragmatic reason for a ‘middle ground’ position on equity is that longevity and legitimacy of a biodiversity offset scheme often derive from landholders’ and communities’ perception of the scheme as being fair and equitable (Narloch et al. 2013). Therefore, considering those issues might be of importance if these schemes aim at being long lasting. A normative reason for this could be that sustainable development is meant to have positive environmental, economic and social outcomes, therefore it is impossible to think about environmental outcomes, without considering its social dimension.

In this paper, equity has only been considered for one conservation mechanism in NSW, the biobanking scheme. However, other conservation mechanisms exist in NSW, such as the Conservation Management Program

for example. Further study could consider the question of equity across several conservation programs in NSW, as it is possible that, while individual schemes might not necessarily be equitable, the full suite of schemes available across NSW may provide a certain level of equity. Another priority for further study would be to look at whether a scheme such as biobanking has the potential to be adopted by indigenous landholders in NSW.

Notes

1. PES can be defined as: (1) voluntary transactions (2) between service users (3) and service providers (4) that are conditional on agreed rules of natural resource management (5) for generating offsite services (Wunder 2015, p. 241).
2. This Act aimed at regulating land clearing in rural areas of NSW. Landholders who wanted to clear part of their land were required to develop a Native Vegetation Plan where they agreed to offset the impact of clearing a part of their property by setting aside and improving the state of land with a high conservation value in other parts of their property.
3. Biodiversity Certification enabled planning authorities to undertake a streamlined biodiversity assessment project, at the landscape scale, for areas identified as development areas during the strategic planning process.
4. The policy aimed at clarifying and standardising the offset process for major projects (state significant development and infrastructure).
5. These empirical categories have been identified based on landholders' legal status, as well as the 'motivations' that explain their participation in the scheme (e.g. public landholders need to derive funds to manage public lands, while entrepreneurial landholders buy land strategically to make a profit).
6. At the time of study, no significant changes had been made regarding the process of landholder participation between the BioBanking and the BOS. As a result, we could interview landholders' having engaged with the BioBanking or the BOS, without that impacting our findings.
7. For landholders who did not have knowledge of the scheme, the questions were framed around the characteristics a scheme would need to have and the type of support/information they would need to be provided to find it attractive. This line of questioning led landholders to talk about positive experience they had with other conservation programs, usually grants from the Local Land Services.
8. The ecological assessment determines the type and number of credits present on a property.
9. This landholder was in the process of participating in the biobanking scheme. However, we included him in the 'participant' category as he was not seeing any obstacle to his future participation, beside the current credit price. This is in contrast with another landholder who was in the process of finalising the ecological assessment of the land, but still had doubts regarding participation. This landholder was considered as 'non-participant' in the study.

10. The cost of the assessment would then be deducted from the credit sale from the landholder to the OEH.
11. Part A represents the *management*, that is, money the landholder will receive in perpetuity to improve the state of biodiversity on his/her land

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References

- Apostolopoulou E, Adams WM. 2017. Biodiversity offsetting and conservation: reframing nature to save it. *Oryx*. 51(1):23–31. doi:10.1017/S0030605315000782.
- BenDor T, Brozovic N, Pallathucherial VG. 2008. The social impacts of wetland mitigation policies in the United States. *J Plan Lit*. 22(4):341–357. doi:10.1177/0885412207314011.
- Bennett G, Gallant M, Ten Kate K. 2017. State of biodiversity mitigation 2017 - markets and compensation for global infrastructure development. Washington D.C.: Forest Trends' Ecosystem Marketplace.
- Bidaud C, Schreckenber K, Rabeharison M, Ranjatson P, Gibbons J, Jones J. 2017. The sweet and the bitter: intertwined positive and negative social impacts of a biodiversity offset. *Conserv Soc*. 15(1):12. doi:10.4103/0972-4923.196315.
- Bourdieu P. 1986. The forms of capital. In: Richardsun JE, editor. *Handbook of theory of research for the sociology of education*. Westport, CT: Greenwood Press; p. 46–58.
- Bremer LL, Farley KA, Lopez-Carr D. 2014. What factors influence participation in payment for ecosystem services programs? An evaluation of Ecuador's SocioPáramo program. *Land Use Policy*. 36:122–133. doi:10.1016/j.landusepol.2013.08.002.
- Bull JW, Strange N. 2018. The global extent of biodiversity offset implementation under no net loss policies. *Nat Sustainability*. 1(12):790–798. doi:10.1038/s41893-018-0176-z.
- Bull JW, Suttle KB, Gordon A, Singh NJ, Milner-Gulland EJ. 2013. Biodiversity offsets in theory and

- practice. *Oryx*. 47(3):369–380. doi:10.1017/S003060531200172X.
- Byron N, Craik W, Keniry J, Possingham H. 2014. A review of biodiversity legislation in NSW. Final Report. Independent Biodiversity Legislation Review Panel.
- Calvet-Mir L, Corbera E, Martin E, Fisher AJ, Gross-Camp N. 2015. Payments for ecosystem services in the tropics: a closer look at effectiveness and equity. *Curr Opin Environ Sustainability*. 14:150–162. doi:10.1016/j.cosust.2015.06.001.
- Coleman JS. 1990. Foundations of social theory. Cambridge (MA): Belknap Press of Harvard University Press.
- Cooke B, Corbo-Perkins G. 2018. Co-opting and resisting market based instruments for private land conservation. *Land Use Policy*. 70:172–181. doi:10.1016/j.landusepol.2017.10.027.
- Cooke B, Langford WT, Gordon A, Bekessy S. 2012. Social context and the role of collaborative policy making for private land conservation. *J Environ Plan Manage*. 55(4):469–485. doi:10.1080/09640568.2011.608549.
- Cooke B, Moon K. 2015. Aligning ‘public good’ environmental stewardship with the landscape-scale: adapting MBIs for private land conservation policy. *Ecol Econ*. 114:152–158. doi:10.1016/j.ecolecon.2015.03.027.
- Corbera E, Kosoy N, Martínez Tuna M. 2007. Equity implications of marketing ecosystem services in protected areas and rural communities: case studies from Meso-America. *Global Environ Change*. 17(3–4):365–380. doi:10.1016/j.gloenvcha.2006.12.005.
- Corbera E, Soberanis CG, Brown K. 2009. Institutional dimensions of payments for ecosystem services: an analysis of Mexico’s carbon forestry programme. *Ecol Econ*. 68(3):743–761. doi:10.1016/j.ecolecon.2008.06.008.
- Damiens FLP, Porter L, Gordon A. 2020. The politics of biodiversity offsetting across time and institutional scales. *Nat Sustainability*. Published: 9th of November 2020. doi:10.1038/s41893-020-00636-9
- Dupont V. 2017. Biodiversity offsets in NSW Australia: the biobanking scheme versus negotiated offsets in urban areas. *J Environ Law:ewq031*. doi:10.1093/jel/ewq031.
- Fisher R. 2013. ‘A gentleman’s handshake’: the role of social capital and trust in transforming information into usable knowledge’. *J Rural Stud*. 31:13–22. doi:10.1016/j.jrurstud.2013.02.006.
- Franks JR, McGloin A. 2007. Joint submissions, output related payments and environmental co-operatives: can the Dutch experience innovate UK agri-environment policy? *J Environ Plan Manage*. 50(2):233–256. doi:10.1080/09640560601156482.
- Friedman RS, Law EA, Bennett NJ, Ives CD, Thorn JPR, Wilson KA. 2018. How just and just how? A systematic review of social equity in conservation research. *Environ Res Lett*. 13(5):053001. doi:10.1088/1748-9326/aabede.
- Froger G, Ménard S, Méral P. 2015. Towards a comparative and critical analysis of biodiversity banks. *Ecosyst Serv*. 15:152–161. doi:10.1016/j.ecoser.2014.11.018.
- Garbach K, Lubell M, DeClerck FAJ. 2012. Payment for ecosystem services: the roles of positive incentives and information sharing in stimulating adoption of silvopastoral conservation practices. *Agric Ecosyst Environ*. 156:27–36. doi:10.1016/j.agee.2012.04.017.
- García-Amado LR, Ruiz Pérez M, Reyes Escutia F, Barrasa García S, Contreras Mejía E. 2011. Efficiency of payments for environmental services: equity and additionality in a case study from a biosphere reserve in Chiapas, Mexico. *Ecol Econ*. 70(12):2361–2368. doi:10.1016/j.ecolecon.2011.07.016.
- Gómez-Baggethun E, Ruiz-Pérez M. 2011. Economic valuation and the commodification of ecosystem services. *Prog Phys Geogr Earth Environ*. 35(5):613–628. doi:10.1177/0309133311421708.
- Gordon A, Bull JW, Wilcox C, Maron M, Banks-Leite C. 2015. FORUM: perverse incentives risk undermining biodiversity offset policies. *J Appl Ecol*. 52(2):532–537. doi:10.1111/1365-2664.12398.
- Griffiths VF, Bull JW, Baker J, Milner-Gulland EJ. 2019a. No net loss for people and biodiversity. *Conserv Biol*. 33(1):76–87. doi:10.1111/cobi.13184.
- Griffiths VF, Sheremet O, Hanley N, Baker J, Bull JW, Milner-Gulland EJ. 2019b. Local people’s preferences for biodiversity offsets to achieve ‘no net loss’ for economic developments. *Biol Conserv*. 236:162–170. doi:10.1016/j.biocon.2019.05.049.
- Haas JC, Loft L, Pham TT. 2019. How fair can incentive-based conservation get? The interdependence of distributional and contextual equity in Vietnam’s payments for forest environmental services program. *Ecol Econ*. 160:205–214. doi:10.1016/j.ecolecon.2019.02.021.
- Hejnowicz AP, Raffaelli DG, Rudd MA, White PCL. 2014. Evaluating the outcomes of payments for ecosystem services programmes using a capital asset framework. *Ecosyst Serv*. 9:83–97. doi:10.1016/j.ecoser.2014.05.001.
- Hillman M, Instone L. 2010. Legislating nature for biodiversity offsets in New South Wales, Australia. *Soc Cult Geogr*. 11(5):411–431. doi:10.1080/14649365.2010.488746.
- Hrabanski M. 2015. The biodiversity offsets as market-based instruments in global governance: origins, success and controversies. *Ecosyst Serv*. 15:143–151. doi:10.1016/j.ecoser.2014.12.010.
- Jones N, Sophoulis CM, Iosifides T, Botetzagias I, Evangelinos K. 2009. The influence of social capital on environmental policy instruments. *Environ Polit*. 18(4):595–611. doi:10.1080/09644010903007443.
- Krause T, Loft L. 2013. Benefit distribution and equity in Ecuador’s Socio Bosque program. *Soc Nat Resour*. 26(10):1170–1184. doi:10.1080/08941920.2013.797529.
- Lastra-Bravo XB, Hubbard C, Garrod G, Tolón-Becerra A. 2015. What drives farmers’ participation in EU agri-environmental schemes?: results from a qualitative meta-analysis. *Environ Sci Policy*. 54:1–9. doi:10.1016/j.envsci.2015.06.002.
- Mahanty S, Suich H, Tacconi L. 2013. Access and benefits in payments for environmental services and implications for REDD+: lessons from seven PES schemes. *Land Use Policy*. 31:38–47. doi:10.1016/j.landusepol.2011.10.009.
- Maron M, Hobbs RJ, Moilanen A, Matthews JW, Christie K, Gardner TA, Keith DA, Lindenmayer DB, McAlpine CA. 2012. Faustian bargains? Restoration realities in the context of biodiversity offset policies. *Biol Conserv*. 155:141–148. doi:10.1016/j.biocon.2012.06.003.
- Maron M, Ives CD, Kujala H, Bull JW, Maseyk FJF, Bekessy S, Gordon A, Watson JEM, Lentini PE, Gibbons P, et al. 2016. Taming a wicked problem: resolving controversies in biodiversity offsetting. *BioScience*. 66(6):489–498. doi:10.1093/biosci/biw038.
- McDermott M, Mahanty S, Schreckenberg K. 2013. Examining equity: a multidimensional framework for assessing equity in payments for ecosystem services. *Environ Sci Policy*. 33:416–427. doi:10.1016/j.envsci.2012.10.006.
- Mettepenningen E, Beckmann V, Eggers J. 2011. Public transaction costs of agri-environmental schemes and their determinants—analysing stakeholders’ involvement

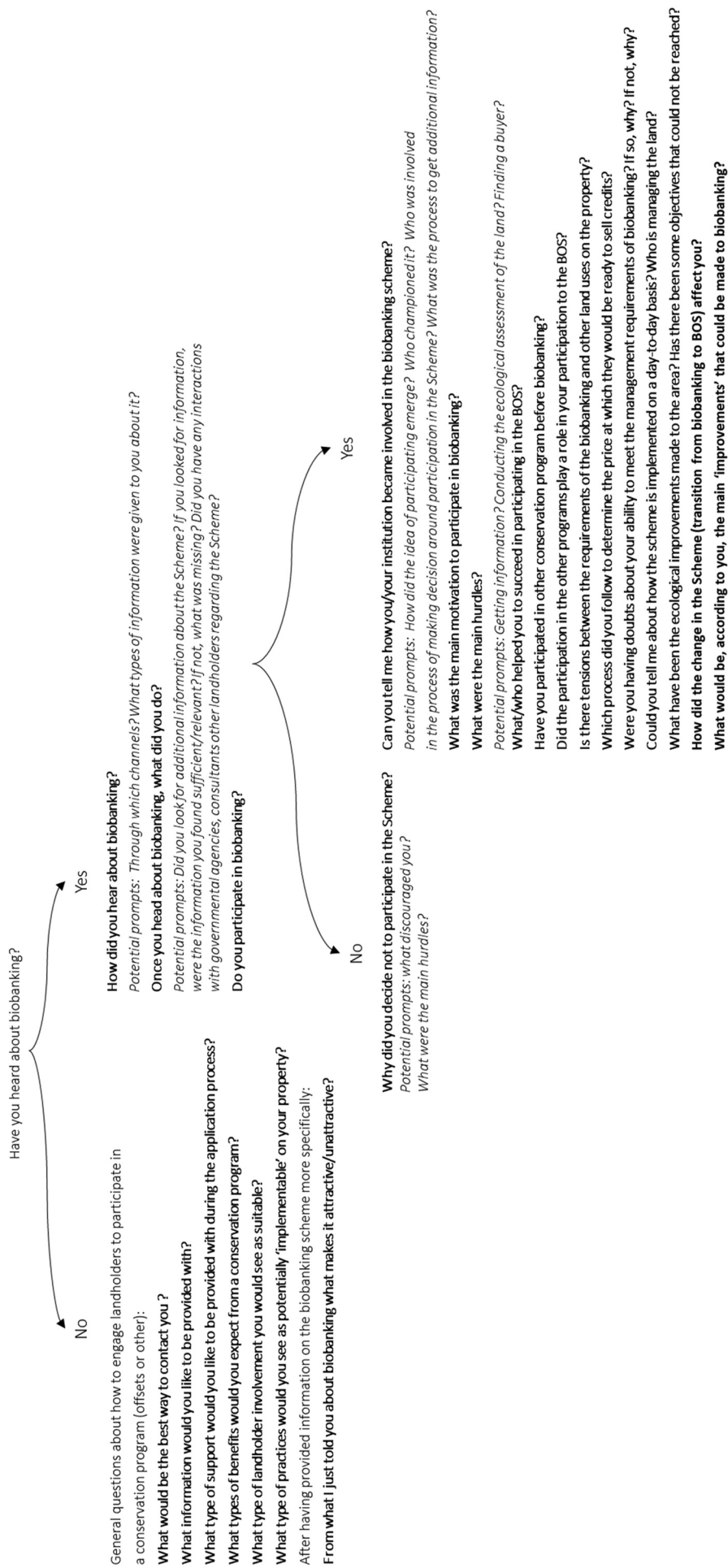
- and perceptions. *Ecol Econ.* 70(4):641–650. doi:10.1016/j.ecolecon.2010.10.007.
- Moore S, Renton S. 2002. Remnant vegetation, landholders' values and information needs: an exploratory study in the West Australian wheatbelt. *Ecol Manage Restor.* 3(3):179–187. doi:10.1046/j.1442-8903.2002.00111.x.
- Morrison M, Oczkowski E, Greig J. 2011. The primacy of human capital and social capital in influencing landholders' participation in programmes designed to improve environmental outcomes*. *Aust J Agri Resour Econ.* 55(4):560–578. doi:10.1111/j.1467-8489.2011.00554.x.
- Muradian R, Corbera E, Pascual U, Kosoy N, May PH. 2010. Reconciling theory and practice: an alternative conceptual framework for understanding payments for environmental services. *Ecol Econ.* 69(6):1202–1208. doi:10.1016/j.ecolecon.2009.11.006.
- Narloch U, Pascual U, Drucker AG. 2013. How to achieve fairness in payments for ecosystem services? Insights from agrobiodiversity conservation auctions. *Land Use Policy.* 35:107–118. doi:10.1016/j.landusepol.2013.05.002.
- Opdam P. 2014. Social-ecological networks. Building connections for sustainable networks. Pamphlet. Wageningen.
- Pagiola S. 2008. Payments for environmental services in Costa Rica. *Ecol Econ.* 65(4):712–724. doi:10.1016/j.ecolecon.2007.07.033.
- Pascual U, Phelps J, Garmendia E, Brown K, Corbera E, Martin A, Gomez-Baggethun E, Muradian R. 2014. Social equity matters in payments for ecosystem services. *BioScience.* 64(11):1027–1036. doi:10.1093/biosci/biu146.
- Porras I. 2010. Fair and green? Social impacts of payments for environmental services in Costa Rica. *Int Inst Environ Dev.* 3–30.
- Prager K, Reed M, Scott A. 2012. Encouraging collaboration for the provision of ecosystem services at a landscape scale—rethinking agri-environmental payments. *Land Use Policy.* 29(1):244–249. doi:10.1016/j.landusepol.2011.06.012.
- Putnam R. 1993. *Making democracy work: civic traditions in modern Italy.* Princeton (NJ): Princeton University Press.
- Putnam R. 2000. *Bowling alone: the collapse and revival of American community.* New York: Simon & Schuster Paperbacks.
- Sommerville M, Jones JPG, Rahajaharison M, Milner-Gulland EJ. 2010. The role of fairness and benefit distribution in community-based payment for environmental services interventions: A case study from Menabe, Madagascar. *Ecol Econ.* 69(6):1262–1271. doi:10.1016/j.ecolecon.2009.11.005.
- Spash CL. 2015. Bulldozing biodiversity: the economics of offsets and trading-in nature. *Biol Conserv.* 192:541–551. doi:10.1016/j.biocon.2015.07.037.
- Taylor BM, Van Grieken M. 2015. Local institutions and farmer participation in agri-environmental schemes. *J Rural Stud.* 37:10–19. doi:10.1016/j.jrurstud.2014.11.011.
- Vaissière A-C, Quétier F, Calvet C, Levrel H, Wunder S. 2020. Biodiversity offsets and payments for environmental services: clarifying the family ties. *Ecol Econ.* 169:106428. doi:10.1016/j.ecolecon.2019.106428.
- Williams P. 2016. Chapter 12 biodiversity. In: Williams P, editor. *The environmental law handbook: planning and land use in NSW.* 6th ed. Pyrmont (NSW): Thomson Reuters Professional; p. 1083.
- Woolcock M. 1998. Social capital and economic development: toward a theoretical synthesis and policy framework. *Theory Soc.* 27(2):151–208. doi:10.1023/A:1006884930135.
- Wunder S. 2015. Revisiting the concept of payments for environmental services. *Ecol Econ.* 117: 234–243. doi:10.1016/j.ecolecon.2014.08.016
- Zbinden S, Lee DR. 2005. Paying for environmental services: an analysis of participation in Costa Rica's PSA program. *World Dev.* 33(2):255–272. doi:10.1016/j.worlddev.2004.07.012.

Appendix A. Interview guide

1. Characteristics of the landholder/institution and the land:

- Could you tell me about the organisational/business structure of [name of the institution/name of the operation]?
- Could you tell me about your role in [name of the institution]?
- Could you tell me what your age is?
- What is your educational background?
- What is your main occupation? Do you have a secondary occupation?
- What is the size of the property?
- Since when do you or your institution own the property?
- How much bushland is there on the property? How much is under biobanking (if relevant)?
- What are the main activities undertaken on the property?
- What are the activities undertaken on the property regarding bush management?
- What is your role on the property?
- Is there going to be a change in ownership in the near future? If so, why?
- Have you previously participated in a landownership program (for conservation)? If yes, which one(s)? What motivated you to participate in these programs? If no, why?
- If you had to distinguish between different 'phases' in the history of your property, what would they be?

2. Landholders' experiences with and perspectives on the scheme



3. Other factors influencing decision-making regarding private land conservation

Do you think that private landholders have a role to play in protecting biodiversity in NSW? If so, how?

What types of activities on private lands do you think could negatively affect biodiversity?

What is the source of information you consult/trust around conservation/environmental management?

How would you think that your family members/peers would react if you were to participate in biobanking? How do you think that these opinions could influence/not influence your decision?

Do you think that the requirements of the scheme are achievable? If yes, why, and what would make you more confident? If not, why?

What would be the management requirements that you would consider suitable for your property?

Do you think that the activities required under the biobanking scheme are matching/contradicting your expectations in terms of what the property should look like and what you want to achieve? If they are matching, could you tell me a bit more about how they match? If they are contradicting, could you tell me more about it? What types of activities would be more acceptable for you?

What are the supplier/channels of information you are more likely to consult and trust (e.g. advisor, ag peak body, neighbours, family members, government, etc.) regarding conservation?

What types of information do you receive through each channel?