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SERVICES SUPPLIED BY PAPUA NEW
GUINEA'S FORESTS THAT ARE NOT
TRADED ON MARKETS SHOULD
BE CONSIDERED IN LAND USE
DECISIONS:
WHY AND HOW?

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Key Points

- The livelihoods of most people in Papua New Guinea (PNG) are strongly linked to natural resources.
- Forests in PNG provide non-market forest ecosystem services (NFEs), which are services that are not sold in markets (). An example of an NRE is climate regulation, which can lower the incidence of drought and frost.
- NFEs contribute to the welfare of PNG residents; however, NFEs are not well known and their supply are rarely considered in land use decisions.
- Supply of NFEs could be increased by promoting payment for NFEs and encouraging forest and agricultural management systems that promote them.
- Other strategies to increase supply include developing environmental awareness programs, encouraging more research into the supply of NFEs and training more natural resource managers.
- The state has much to gain from payment for NFEs through taxes, and PNG residents will benefit from improved environmental quality.

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SERVICES SUPPLIED BY PAPUA NEW GUINEA'S FORESTS THAT ARE NOT TRADED ON MARKETS SHOULD BE CONSIDERED IN LAND USE DECISIONS: WHY AND HOW?

By Eugene Ezebilo and Thomas Wangi

Most benefits from forests that are not traded on markets (non-market forest ecosystem services; NFEs), such as climate regulation and water and air purification, contribute to the welfare of Papua New Guinean residents. The drought and frost that affected approximately two million people in Papua New Guinea (PNG) in 2015 are examples of environmental problems that the supply of relevant NFEs has the potential to mitigate. However, NFEs are not often considered in land use decisions because their economic values (benefits and costs) are not well known.

This paper focuses on the importance of considering NFEs in land use decisions and offers potential strategies to motivate relevant stakeholders to incorporate supply of NFEs in decision-making. The livelihoods of most people in PNG are strongly linked to natural resources. As such, PNG must efficiently use natural resources and combat human activities that contribute to the loss of NFEs.

To encourage the supply of NFEs, government agencies could initiate a program for payment for NFEs, encourage the use of forest management systems that promote continuous cover of forestland by trees, and monitor the activities of forestry and oil palm companies. Other potential strategies include: promote public awareness of the importance of NFEs, encourage more research into the supply of NFEs, and incorporate nature areas in urban development plans. The state has much to benefit from payment for NFEs through taxes and society would benefit from the associated improvements in environmental quality.

Ecosystem services

Ecosystem services are benefits that people obtain from ecosystems (e.g. forests, rivers, seas and oil palm farms) that contribute to making human life possible and worth living (Millennium Ecosystem Assessment, 2005). Ecosystem services can be classified as:

- Provisioning services. These are products such as timber, game (hunted animals), fuel wood, berries, mushrooms, fish and crabs that are obtained from ecosystems.
- Supporting services. These are services required for production of other services such as nutrient recycling and water cycling services provided by forests.
- Regulating services. These are benefits people get from the regulation of ecosystem processes, such as regulation of air and water quality and climate, which maintains rainfall and temperature.
- Cultural services. These are non-material benefits, such as recreation and aesthetic experiences, and cognitive development, which people obtain from ecosystems.

Market and non-market ecosystem services

Forests provide a mix of services, such as timber and fuel wood that are traded on markets (forest market ecosystem services), as well as services that cannot be sold in markets (NFEs). NFEs include climate regulation, water and air purification, and aesthetic experiences (enjoyment of natural beauty).

The economic values of forest market ecosystem services are well known by PNG residents and are reflected in market prices. However, the value of NFEs is not well known and research is often required to estimate it. To this end the economic value of NFEs is not often incorporated into policy decisions associated with land use in PNG. This contributes to the mismanagement of forest resources that provide these services, which is strongly linked to environmental problems such as the drought and water shortages that affect some provinces of PNG.

To move PNG forward, we must develop land use strategies that promote the supply of NFEs. Furthermore, most NFEs are public goods; that is, once produced, people cannot be excluded from using them (non-excludable) and the use of a service by an individual does not reduce its availability to

other people (i.e. non-rivalry) (Ezebilo, 2016a). This makes it practically impossible to charge people for using NFEs. This means that people who benefit from NFEs would not fully pay for the services, which leads to undervaluation of the contribution of NFEs to PNG's economy, as well as overexploitation of forests.

Conversely, market forest ecosystem services have characteristics of private goods, i.e. excludability and rivalry. However, some NFEs such as recreation experience associated with the use of recreation area free of charge belongs to congestion goods. This implies that it is practically impossible to exclude people from using the area for recreation. However, as the number of people using the area increases, it will get to a point where the benefit that each person gets from the area decreases due to overcrowding.

Non-market forest ecosystem services must be considered in land use decisions

PNG is a typical example of a country where the welfare of its residents is based on a mix of market forest ecosystem services (e.g. timber, fuel wood and mushrooms) and NFEs (e.g. water and air purification and climate regulation). As the economic value of NFEs is not well known in PNG, management of NFEs is rarely incorporated into land use decisions.

Accounting for the economic value of NFEs can help policy-makers and land use planners make informed decisions about allocating resources between competing uses of land and enable efficient use of natural resources. This could be used as justification for funding initiatives aimed at managing PNG's natural resources towards provision of NFEs. It can also be used to support policy that promotes the supply of NFEs. In order to design a sound policy for the management of NFEs that contributes to societal welfare, knowledge of the costs and benefits associated with maintaining NFEs is crucial.

A policy that favours increased government spending on amenities that promote NFEs is likely to stimulate local participation in activities that lead to the provision of NFEs. Consequently, it is important that the policy provides incentives that take into account individual preferences and the different restrictions they face in providing NFEs.

PNG must focus on supplying several non-market forest ecosystem services

To lower the incidence of environmental problems such as drought and frost, as a matter of urgency, PNG must develop a land use strategy that promotes the supply of several NFEs at the same time. As residents' preferences and demands for

NFEs are diverse, PNG's environment must be managed in a sustainable manner so that residents benefit as much as possible from NFEs. It is important to note that PNG's current environmental problems are strongly linked to the attention given to market forest ecosystem services, whereas NFEs such as climate regulation are often neglected in land use decisions. For example, the production of timber is typically the main focus of PNG forestry. However, focusing on only one service provided by forests could lead to loss of others.

The drought and frost that affected some provinces of PNG in 2015 (The National newspaper, page 2, August 31, 2015) have a strong link to the misuse of environmental resources and the neglect of most NFEs. For example, some forestry companies that have concessions for extracting timber in PNG, harvest trees on a large scale without either planting new trees or considering the negative impacts of their activities on the environment. Furthermore, some oil palm companies, especially in West New Britain Province, harvest oil palm trees on a large scale without routinely planting new trees. Even in Port Moresby, some residents have an inherent behaviour of burning any vegetation they come across. These human activities contribute to destroying PNG's ecosystems and depleting the NFEs they provide, which lowers the welfare of residents. To move PNG forward, it is important that government agencies in charge of environment conservation encourage land use that promotes the supply of several market forest ecosystem services and NFEs at the same time.

Incorporating supply of non-market forest ecosystem services into land use decisions

As NFEs contribute to sustaining PNG's natural environment and lower the risk of environmental hazards, relevant government agencies should develop strategies that promote the incorporation of NFEs into land use decisions, such as listed below.

- Develop an incentive mechanism that promotes payment for ecosystem services. Some land use activities promote supply of several NFEs (e.g. reforestation), whereas others lead to loss of these NFEs (e.g. deforestation). As the supply of NFEs attracts costs, people who engage in activities that promote supply could be given a subsidy such as tax rebate. People whose activities deplete NFEs could be made to pay for the loss through higher taxes (i.e. Polluter-Pays Principle). This implies that a polluter should bear the cost of measures taken to maintain an acceptable level of environmental quality.
- Monitor activities of forestry and oil palm companies. Forestry and oil palm companies belong to the private sector whose main goal is to maximise profit. Such com-

panies do not have incentives to reduce activities that destroy the environment. The state has the ultimate responsibility to safeguard PNG's natural environment against destructive human activities. It is important that government agencies in charge of agriculture, forestry and environmental conservation develop management strategies for reducing the negative impacts of human activities on the environment. For example, forest management systems that allow continuous availability of trees in forestland, even after harvesting timber such as continuous cover forestry and shelter wood, should be promoted. Forestry companies could plant new trees a few months after harvesting old trees. Furthermore, oil palm companies should avoid cutting down and burning large numbers of oil palm trees when they intend to plant new ones, as this may cause pollution and deplete NFEs that contribute to stabilising elements of climate such as environmental temperature and rainfall. It is important that all relevant government agencies monitor the activities of forestry and oil palm companies in PNG to ensure they conform to the principles that safeguard our environment.

- Include nature conservation areas in urban development plans. To promote the supply of NFEs in residential and commercial development areas, it is important to identify biological diversity hotspots (i.e. areas rich in plant and animal species) during urban development planning. Areas that have been identified as biological diversity hotspots should be reserved for nature conservation. For example, there are pockets of mangrove forestland on the Port Moresby-LNG road that have been earmarked for development instead of conservation. If development takes place in this area, it may result in the destruction of mangroves and the NFEs they provide, which could have long-term negative implications on the area.
- Conduct public awareness programs that educate about the importance of NFEs. As most people in PNG are not well informed about the benefits and costs associated with the supply of NFEs, it is important to inform them about the contribution of NFEs to human wellbeing and the consequences associated with depleting them. For example, forests contribute to climate regulation and the purification of air and water. Deforestation results in drought, water shortages and air pollution.
- Encourage research into types of NFEs. PNG is one of the most biologically diverse countries in the world (i.e. rich in plants and animal species) and has huge potential for the supply of several NFEs. However, there are only a few published papers about supply and demand of NFEs in PNG (e.g. Ezebilo, 2016b; Green et al., 2009).

For example, in a study of urban residents' willingness to pay for the maintenance of Mount Wilhelm, Ezebilo (2016b) found that Kundiawa residents would be willing to pay a bequest value to enable their future recreational use of Mount Wilhelm. Green et al. (2009) used systematic conservation planning to design networks of marine protected areas in Kimbe, West New Britain Province, to be resilient to climate change. It is important to consider the findings from these types of studies when developing policies related to land use in PNG.

- Conduct a thorough environmental impact assessment before development. In PNG, environmental impact assessment is either not carried out or not conducted thoroughly on "greenfield" before development. To reduce the risk of destroying ecosystems that provide valuable NFEs, the Department of Lands and Physical Planning should collaborate with Department of Environment and Conservation in developing "greenfield". A thorough environmental impact assessment that involves experts should be conducted before developing a "greenfield".
- Train more natural resource managers. There are only a few Environmental and Resource Economists in PNG, which implies that there are few local experts available to conduct research into economic valuations of the environment. Furthermore, PNG needs more ecologists and forest scientists to move the country toward achieving sustainable development. To attract more students to the field of Economics, especially Environmental and Resource Economics, potential students could be offered scholarships. Currently, the Department of Economics at the University of Papua New Guinea does not have enough lecturers, and does not offer Masters or Doctoral programs in Economics. It is important to attract more PNG economists to the university so that they can educate future natural resource managers.

Policy implications

Incorporating benefits and costs associated with the supply of NFEs in land use decisions in PNG would impact upon the use of our natural resources. Some of the implications are listed below:

- Impacts of loss of NFEs on human welfare are often felt in the long-term. Measures often used to reduce loss of NFEs cost money and the impact of the loss of NFEs is not often felt in the short-term. To this end, policy-makers may believe there is no justification to invest in infrastructure that promotes the supply of NFEs. However, the potential benefits from preventing drought often outweigh the costs of managing a drought situation. For

this reason, it is important that policy-makers apply precautionary principles and consider intergenerational and intragenerational concerns in the supply of NFEs.

- PNG does not have sufficient human resources to conduct environmental valuations. The state should encourage existing PNG experts to continue research into environmental impact assessment. To mitigate the current shortage of local expertise, foreign experts should be engaged in research until sufficient numbers of local experts are trained. This will help the existing PNG experts gain experience that could be passed to future environmental impact assessment experts.
- Demand for land for development is greater than that for nature conservation. As state-owned land is almost exhausted in PNG, we may be tempted to allocate land earmarked for conservation to development. For PNG to move forward, it is important to allocate land based on suitability rather than demand driven by private individuals. It is the responsibility of the state to safeguard PNG's natural heritage and nature conservation areas. As benefits of providing NFEs accrue in the long-term, private individuals would not be willing to invest in nature conservation activities.
- The state does not have money to compensate people whose activities promote supply of NFEs. If payment for NFEs is well designed, the state could get a lot of money through taxes from private individuals and corporate bodies whose activities degrade the environment. These taxes could fund subsidies that reward people whose activities promote supply of NFEs.
- How can we package ecosystem services awareness programs to maximise use of scarce resources? Health, food and improvement in welfare are of interest to most people. The NFEs awareness program could be incorporated into health or agriculture intervention programs. Moreover, the drought and frost that led to water and food shortages in PNG in 2015 are still fresh in people's minds. This is the appropriate time to educate the public about probable causes of the drought and flood and activities that could mitigate future occurrences.

Concluding remarks

This paper highlights the importance of incorporating the supply of NFEs in decisions related to uses of natural re-

sources in PNG. Several NFEs have the potential to contribute to lowering the risk of environmental hazards in PNG; however, the supply of NFEs is not often considered in land use decisions in PNG. The drought and frost that occurred in several provinces in PNG in 2015 are examples of potential consequences of not considering the supply of NFEs in decision-making.

Strategies that government could use to increase the supply of NFEs in PNG include: introduce incentives that promote payment for NFEs, thoroughly monitor the activities of forestry and oil palm companies, develop NFEs awareness programs, encourage research into the supply of NFEs, and include nature conservation areas in urban development plans. The state has much to gain from taxes that accrue from payment for NFEs, and PNG residents would benefit from improvements in environmental quality that should translate into improvements in their welfare. We hope this paper will provide policy-makers, forest managers, and land use planners with greater understanding of the importance of incorporating the supply of NFEs in decisions associated with land use.

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