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**COMMUNITY-BASED MONITORING,
REPORTING AND VERIFICATION OF REDD
PROJECTS: INNOVATIVE POTENTIALS FOR
BENEFIT SHARING**

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Community-based Monitoring, Reporting and Verification of REDD Projects: Innovative Potentials for Benefit Sharing

Kristy Graham and Amelia Thorpe*

Reducing Emissions from Deforestation and Forest Degradation (REDD) has rapidly become a key focus of discussions in the development of a future climate change regime to be agreed at the United Nations Framework Convention on Climate Change (UNFCCC) meetings in Copenhagen. While support for REDD at a general level is high, there remains considerable divergence on detailed issues of implementation. Monitoring, reporting and verification (MRV) of REDD projects to accurately quantify emissions reductions is a key issue, particularly given that there is limited capacity to undertake MRV at the level required by the international community in the developing countries where REDD projects are intended to take place. This paper discusses the importance of MRV to REDD and the potential of community-based mechanisms to improve capacity, as well as helping to address other contentious issues such as equitable benefit-sharing. The paper will focus on Papua New Guinea (PNG), drawing lessons of applicability to developing countries more generally.

I. Introduction

The importance of forests in regulating the global climate, particularly as a store and sink of carbon, is widely recognised.¹ Forest protection as a climate mitigation measure has been acknowledged at the

international level,² and has been an important element of UNFCCC discussions since its inclusion in the Bali Action Plan at the 13th Conference of the Parties in Bali, Indonesia in 2007 (COP 13).³ The REDD debate has developed into its current form, REDD plus,⁴ which also includes sustainable forest management, conservation and enhancement of carbon stocks in the suite of actions that may be eligible for international funding. It is widely thought that any international climate change agreement at COP 15 in Copenhagen in December 2009 will include a REDD mechanism, with details to follow in subsequent meetings of the UNFCCC.

The REDD debate has emerged at a key time for Pacific nations: in addition to their crucial role in stabilising the global climate, Pacific forests are disappearing at an unprecedented rate. PNG has played a major role in REDD debates, with the national government leading the Coalition for Rainforest Nations' push for its inclusion in the future climate change regime. Building on work with local groups in PNG, this paper will investigate the potential for REDD to achieve both mitigation

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1 Holly Gibbs et al., "Monitoring and Estimating Tropical Forest Carbon Stocks: Making REDD a Reality" 2 Environmental Research Letters (2007), at p. 1.

2 Richard Houghton, "Tropical Deforestation as a Source of Greenhouse Gas Emissions" in Paulo Mutinho and Stephan Schwartzman (eds) Tropical Deforestation and Climate Change (Belem: IPAM 2005).

3 Decision 1/CP.13, Bali Action Plan, UN Doc. FCCC/CP/2007/6/Add.1, 15 December 2007.

4 UNFCCC Subsidiary Body for Scientific and Technical Advice, "Report on the Expert Meeting of Methodological Issues Relating to the Reference Emissions Levels and Reference Levels", 14 May 2009, available on the Internet at <<http://unfccc.int/resource/docs/2009/sbsta/eng/02.pdf>> (last accessed 14 July 2009).

objectives and ensure that forests can perform the social, economic and environmental roles essential to local communities.

Although many important details – such as the definitions of projects eligible for REDD – have yet to be negotiated, REDD is also progressing outside of the UNFCCC negotiations. A number of multilateral donors have established REDD programs involving capacity building and pilot projects, including the World Bank and the UN through its development, environment and food and agriculture programs (United Nations Development Programme, United Nations Environmental Programme and Food and Agriculture Organization).⁵ Several pilot projects have already commenced planning and implementation, including projects in Asia and South America.⁶ Many other countries are also discussing potential REDD projects.

PNG is among these countries, and its preparations for REDD have attracted considerable attention.⁷ It is likely that sustainable forest management and reducing degradation will be the predominant activities in PNG eligible to participate in any REDD scheme.⁸ For the purposes of this paper, “sustainable forest management” is used to describe any activities that would be eligible for inclusion under an international REDD agreement.

MRV is widely acknowledged as crucial to the effectiveness of REDD as a climate mitigation strategy, with limited capacity to undertake MRV as a major issue to be addressed in developing coun-

tries. In addition to effectiveness, this paper broadens the debate by considering innovative mechanisms to develop capacity while also achieving co-benefits. MRV is seldom discussed as a way to involve communities in REDD projects, but it has been shown to be effective in a number of community forest management areas.⁹ This paper will investigate the potential for MRV to enable communities to benefit financially from REDD, not only through recognition of their interests in the land on which the project is based, but through the provision of MRV services integral to the success of the project.

II. The PNG Context

The need for a mechanism such as REDD to address deforestation in PNG is widely recognised. At present, over half of PNG’s total land area is covered by intact rainforest.¹⁰ PNG is part (with Indonesia’s West Papua region) of the largest contiguous forest in the Asia-Pacific region, and the third largest tropical rainforest in the world.¹¹ These forests provide the foundation of PNG peoples’ livelihoods, culture and economy.¹² At a global level, PNG’s forests provide a home for over six percent of the world’s biological diversity (despite comprising less than one percent of its land mass), and provide one of the world’s greatest reservoirs of carbon, with an important function in stabilising the climate.¹³ Despite

5 UN-REDD Programme (<http://www.un-redd.org/>) and the World Bank Forest Carbon Partnership Facility (<http://www.forestcarbon-partnership.org/fcp/>).

6 Uddar Mean Chey project in Cambodia; Ulu Masen project in Kalimantan, Indonesia; Noel Kempff project in Bolivia; Juma Reserve project in Brazil.

7 See, e.g., the frequent mentions to PNG on the website REDD-monitor (www.redd-monitor.org).

8 This assumption is based on current UNFCCC definitions of forests and deforestation, and widely accepted definitions of forest degradation. GOF-C-GOLD “Reducing Greenhouse Gas Emissions From Deforestation and Degradation in Developing Countries: a Sourcebook of Methods and Procedures for Monitoring, Measuring and Reporting, GOF-C-GOLD Report version COP13-2”, June 2008, available on the Internet at <<http://www.gofc-gold.uni-jena.de/redd/index.php>> (last accessed 14 July 2009).

9 RECOFT “Research Project: Kyoto, Think Global, Act Local”, 20 January 2009, available on the Internet at <<http://www.communitycarbonforestry.org/>> (last accessed 14 July 2009).

10 Phil Shearman et al., “The State of the Forests in Papua New Guinea, University of Papua New Guinea” 2008, available on the Internet at <www.scienceinpublic.com/png_forests.htm> (last accessed 9 August 2009).

11 After the Amazon and Congo. Eric Kwa, “Climate Change and Indigenous People in the South Pacific”, presentation held at the

IUCN Academy of Environmental Law Conference on “Climate Law in Developing Countries post-2012: North and South Perspectives”, Ottawa Canada, 26–28 September 2008.

12 Over eighty percent of the population in PNG are directly dependent on the local environment for their subsistence and livelihoods (Shearman et al., “Forests in PNG”, supra note 10, at p. 17). Forests provide subsistence food, fertile soils for ‘swidden’ agriculture, building materials and commercial timber. They also provide important local environmental benefits, including watershed protection, water filtration, coastal and reef protection, preservation of fish stocks, soil stability and fertility, landscape benefits and carbon sequestration. PNG’s forests also hold unique cultural and spiritual values, forming the basis of over 800 language groups (Kwa, “Climate Change and Indigenous People”, supra note 11 and Shearman et al., “Forests in PNG”, supra note 10, at p. 19).

13 PNG’s lowland tropical and subtropical moist forests, mangrove forests, tropical savannah woodlands and forest-dependent riverine ecosystems have all been recognised as globally significant. Additionally, PNG’s forests are estimated to contain five gigatonnes of carbon, equivalent to almost 1.5 times the greenhouse gas emissions from energy production worldwide in 2004. Greenpeace International, “Preserving Paradise: The value of protecting Papua New Guinea’s forests for climate”, 2008, available on the Internet at <<http://www.greenpeace.org/australia/resources/reports/deforestation/preserving-paradise/>> (last accessed on 9 August 2009).

increasing recognition of these values at both local and global levels, PNG's forests are disappearing at an alarming rate. Nearly a quarter of the country's forests have been deforested or degraded since independence.¹⁴ If current trends continue, 83 percent of PNG's forests will have been cleared or degraded by 2021.¹⁵

In this context, PNG has played a major role in the debates on REDD mechanisms in preparation for Copenhagen. The national government is a key proponent of the inclusion of REDD in the next agreement under the UNFCCC,¹⁶ and is a vocal member of the Coalition for Rainforest Nations.¹⁷ Leading that coalition, PNG succeeded in having the decision taken at COP 13 in 2007 to explore a range of actions, identify options and undertake efforts to reduce emissions from deforestation and forest degradation.¹⁸

Local community groups¹⁹ and international organizations ranging from Greenpeace to the World Bank²⁰ are also advocating REDD and other market mechanisms such as payment for ecosystem services (PES) for PNG. While sharing the government's recognition that a new approach is necessary, these groups are not simply advocating the adoption of the REDD model promoted by the national government. Instead, community groups have raised concerns that PNG's governance track record and the many external vested interests mean that carbon financing has distracted the country's focus and leadership and could potentially exacer-

bate the country's problems.²¹ A key concern of local landholders and civil society in PNG is benefit sharing, with no formal policy position from the national government at this stage. Civil society organisations have been advocating a PES scheme, with the majority of revenue earmarked for local landholders.²²

If REDD is to be effective in preserving PNG's forests, it will need to provide a comprehensive response to all drivers of forest loss. REDD cannot be seen simply as a new income source for PNG, but must instead be developed to address the root causes of deforestation in PNG: weak governance and the lack of equity in benefit sharing. Close involvement and the distribution of benefits to local communities will be a key to addressing the issue of equity, and given that REDD payments are expected to be performance based, there is potential that REDD will provide the impetus to improve forest governance in PNG.

Poor governance is at the heart of PNG's deforestation and forest degradation. Logging, which in large part is undertaken illegally, unsustainably and, perhaps most worryingly, unchecked, is the primary driver of forest loss in PNG.²³ Forests are being logged at rates far exceeding their capacity to regenerate, demonstrated by declining log sizes and increasing fires.²⁴ Sustainable yield has been the focus of regulation, ignoring many other critical requirements for sustainability. Industry practice is incredibly wasteful, with estimates of almost

14 Shearman et al., "Forests in PNG", supra note 10, at p. 25.

15 Ibid., note 10, at p. 7.

16 UNFCCC "Government of Papua New Guinea and Costa Rica Submissions for reducing emissions from deforestation in developing countries: approaches to stimulate action", 2005, available on the Internet at <<http://unfccc.int/resource/docs/2005/cop11/eng/misc01.pdf>> (last accessed 13 March 2009).

17 The Coalition for Rainforest nations is a group of developing countries with forests formed after a call by the Prime Minister of Papua New Guinea, Sir Michael Somare, which operates as an intergovernmental organization with the Secretariat currently housed at Columbia University, New York. Countries participating within the various activities of the Rainforest Coalition include: Bangladesh, Belize, Central African Republic, Cameroon, Congo, Colombia, Costa Rica, DR Congo, Dominican Republic, Ecuador, Equatorial Guinea, El Salvador, Fiji, Gabon, Ghana, Guatemala, Guyana, Honduras, Indonesia, Kenya, Lesotho, Liberia, Madagascar, Malaysia, Nicaragua, Nigeria, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Samoa, Sierra Leone, Solomon Islands, Suriname, Thailand, Uruguay, Uganda, Vanuatu and Viet Nam, available on the Internet at <<http://www.rainforestcoalition.org/eng/>> (last accessed 13 March 2009).

18 Decision 2/CP.13, Reducing emissions from deforestation in developing countries: approaches to stimulate action, Un Doc. FCCC/CP/2007/6/Add., 1, 15 December 2007.

19 Eveline Trines, Margaret Skutsch and Peter Dam (eds), "Payments for Environmental Services in Papua New Guinea: Policy Paper Kyoto: Think Global, Act Local project", 2008, available on the Internet at <www.communitycarbonforestry.com> (last accessed on 13 March 2009).

20 Bill Hare and Kirsten Macey. "Tropical Deforestation Emission Reduction Mechanism: A Discussion Paper", March 2008, available on the Internet at <<http://www.greenpeace.org/international/press/reports/TDERM-full>> (last accessed on 9 August 2009); World Bank Forest Carbon Partnership Facility REDD Country Participants, available on the Internet at <<http://www.forestcarbonpartnership.org/fcp/node/203>> (last accessed on 17 July 2009).

21 Trines, Skutsch and Dunn (eds), "PES in PNG", supra note 19 and Kwa, "Climate Change and Indigenous Peoples", supra note 11.

22 Trines, Skutsch and Dunn (eds), "PES in PNG", supra note 19.

23 Logging accounts for 48.2 % of forest loss in PNG. Shearman, et al. "Forests in PNG", supra note 10, at p. 25.

24 Ibid at pp. 52–56.

200 m³ of timber destroyed to produce 13 m³ for export.²⁵ Industry practice is also widely recognised as corrupt,²⁶ and human rights abuses against forest communities are widespread.²⁷

The problems of unsustainability, waste and corruption are widely recognised, and have prompted several efforts to reform the forest industry. Conservation and sustainable natural resource management are prioritised in PNG's Constitution,²⁸ and the *Forestry Act 1991* explicitly seeks to "conserve and renew [forest resources and the environment] as an asset for the succeeding generations" and to "contribute towards a sound ecological balance".²⁹ International donors, including Australia and the World Bank, have also provided assistance for numerous reviews, inquiries and reforms.³⁰ While much has been achieved on paper, these initiatives had not brought about any real improvements to the industry. Monitoring and enforcement are woefully inadequate,³¹ and the vast majority of logging in PNG is undertaken illegally (the World Bank estimates that 70% of logging in PNG is illegal, Greenpeace put that figure as high as 90%).³²

Unless these governance issues can be addressed, REDD is unlikely to be any more successful in preserving PNG's forests than previous efforts. As several commentators have suggested, however, the approach taken by the national government in REDD activities to date appears unlikely to achieve this.³³ PNG established an Office of Climate Change and Environmental Sustainability

(OCCES),³⁴ but has not taken any steps to provide a legal basis for the Office or its activities. The OCCES has not worked to inform or educate the community about REDD or climate change, and at times has taken steps to actively discourage discussions among civil society.³⁵ The OCCES has also come under scrutiny for progressing carbon deals without legal authority. In June 2009 the PNG Eco-Forestry Forum obtained an injunction against the Office for issuing permits in Kamula Doso,³⁶ and in July 2009, the Director of the OCCES was suspended after a series of media reports highlighted anomalies with the OCCES issuing multi-million dollar carbon trading deals without any policy or legislation in place.³⁷

Developing effective governance systems will be crucial if REDD is to be accepted as legitimate in PNG, and if it is to be effective in halting forest loss. To satisfy requirements such as additionality and permanence, REDD is likely to be performance-based at the international level (i.e. funding will only be provided after emissions reductions are achieved). MRV will thus be an essential component in demonstrating the success of sustainable forest management, and therefore in attracting REDD funding. Given the significant present lack of capacity in this area in PNG, innovative solutions may be required.

Governance is not the only issue, however. An effective REDD mechanism will need to address the other major driver of forest loss in PNG, the expansion of subsistence agriculture associated with

25 Ibid at p. 56.

26 Ibid, and International Tropical Timber Council (ITTO), "Achieving the ITTO Objective 2000 and Sustainable Forest Management in Papua New Guinea, 42nd sess, ITTC (XLII) 7", 2007, available on the Internet at <http://www.itto.int/en/mision_reports/> (last accessed on 9 August 2009) and The Centre for Environmental Law and Community Rights (CELCOR) and The Australian Conservation Foundation (ACF), "Bulldozing Progress: Human Rights Abuses and Corruption in Papua New Guinea's Large Scale Logging Industry", 2006, available on the Internet at <http://www.acfonline.org.au/articles/news.asp?news_id=990> (last accessed on 9 August 2009) and Greenpeace International, "Preserving Paradise", supra note 13.

27 ITTO, "Achieving Sustainable Forest Management in PNG", supra note 26 and CELCOR & ACF, "Bulldozing Progress", supra note 26, and World Bank & The International Finance Corporation, "Doing Business 2009: Company Profile for Papua New Guinea", 2009, available on the Internet at <www.doingbusiness.org> (last accessed on 9 August 2009).

28 Constitution of the Independent State of Papua New Guinea and The Forestry Act 1991.

29 Forestry Act 1991, Preamble, (a) and (d).

30 CELCOR & ACF, "Bulldozing Progress", supra note 26, at pp. 21–22.

31 ITTO, "Achieving Sustainable Forest Management in PNG", supra note 26 and CELCOR & ACF, "Bulldozing Progress", supra note 26.

32 World Bank & IFC, "Profile for PNG", supra note 27.

33 Global Witness, "Pacific Island's Report", 2008, available on the Internet at <<http://www.pidp.org/pireport/2008/October/10-31-07.htm>> (last accessed on 13 March 2009).

34 Initially, this was the Office of Climate Change and Carbon Trade. Local groups have suggested that the longer name is an attempt to address criticisms that the government is focused on 'carbon dollars'.

35 In late 2008, the Director of the OCCES issued a notice threatening prosecution of NGOs and carbon traders developing REDD activities without written permission. Post Courier, Friday October 17, 2008, at p. 15.

36 PNG Eco-Forestry Forum, "Court stops carbon deal", Press Release, June 5, 2009.

37 Ilya Gridneff, "PNG climate office director suspended", 9 News, Wednesday July 1, 2009, available on the Internet at <<http://news.ninemsn.com.au/world/832299/png-climate-office-director-suspended>> (last accessed on 15 July 2009).

poverty and population growth.³⁸ PNG's population has more than doubled since independence, growing from 2.7 million in 1972 to 5.6 million in 2002,³⁹ and it is predicted to double again in the next 20 years.⁴⁰ High poverty rates (over 40 per cent of the population lives on less than US\$1 per day)⁴¹ mean that this growth has heavily impacted PNG's forests. Local agricultural systems have been pushed beyond critical thresholds as demand for food and saleable produce have increased.⁴² Traditionally, patches of forest were cleared for gardens, cultivated for a few crop cycles and then abandoned as fallows in which the regenerating forest restored soil fertility. With population increases, however, the 'swidden' cycle has shortened and the areas under cultivation have expanded to the point of connection, leaving no fallow or forest regeneration. Forests are effectively being converted to grassland systems, with high fire vulnerability.

If REDD is to be effective in preserving PNG's forests, it will need to provide alternative sources of food, fuel and livelihoods for forest communities. While the introduction of REDD could potentially bring much-needed income for poor forest communities, there is no guarantee that it will. During the negotiations at the UNFCCC meeting in Poznan in 2008, references to the rights of indigenous peoples were removed, leaving instead a weak statement that has drawn considerable opposition from indigenous and conservation groups.⁴³

In this context, there is an urgent need to look for innovative models to enable REDD to address both governance and equity issues. In contrast to the centralised REDD scheme advocated by the government, smaller scale activities with more community involvement may have a greater chance of success as conservation instruments in PNG.

Numerous commentators have suggested that such schemes are necessary to reduce opportunities for corruption and to ensure more equitable distribution of benefits.⁴⁴

In 2007, with the support from the Netherlands Government, an expert consultation group was formed to bring together experts in the area of community development and community forestry. Through an extensive series of discussions throughout 2007 and 2008, the group expressed strong support for a REDD scheme in PNG, incorporating strong community involvement in all REDD-related activities, including monitoring.⁴⁵

III. The Importance of MRV for REDD's Success

Monitoring in a broad sense is defined as 'the systematic measurement of variables and processes over time'.⁴⁶ It assumes that there is a specific reason for collection of data, such as ensuring that standards are being met. Verification, in the context of the UNFCCC, is the process of confirming the authenticity of emissions reductions over a defined time period, generally by an independent entity.⁴⁷ In the context of REDD, monitoring will be the only way to determine whether and how many emissions reductions have occurred. As REDD is anticipated to be a performance based mechanism, monitoring, reporting and verification will be essential in accessing the financial benefits for national governments and landholders, whether REDD is a fund-based or a market-based mechanism.

Avoided deforestation projects were excluded from the first commitment period under the Kyoto Protocol because of, *inter alia*, concerns about the reliability of methods to measure emissions reduc-

38 Subsistence agriculture accounts for 45.6% of forest loss. Shearman et al., "Forests in PNG", supra note 10, at p. 25.

39 World Bank & IFC, "Profile for PNG", supra note 27, at p. 40.

40 ABC Pacific Beat Radio, "PNG Population Set to Double", 2009, available on the Internet at <<http://www.radioaustralia.net.au/pacbeat/stories/200905/s2575118.htm>> (last accessed on 15 July 2009).

41 Aus AID "The Australian Government's Overseas Aid Program Papua New Guinea: Development Challenges", 2009, available on the Internet at <<http://www.ausaid.gov.au/country/papua.cfm>> (last accessed on 13 March 2009).

42 Shearman et al., "Forests in PNG", supra note 10, at p. 40.

43 FERN-Forest Peoples Programme Special report on Poznan, "Climate Change Discussions Fail to Address Indigenous Peoples

Concerns and Leave Activists Believing A Lot Has to be Done", EU Forest Watch Poznan Special Issue, January 2009, available on the Internet at <<http://www.redd-monitor.org/2009/01/13/fern-forest-peoples-programme-special-report-on-poznan>> (last accessed on 7 May 2009).

44 CELCOR & ACF, "Bulldozing Progress", supra note 26; Trines, Skutsch and Dunn (eds), "PES in PNG", supra note 19.

45 Trines, Skutsch and Dunn (eds), "PES in PNG", supra note 19.

46 Finn Danielsen et al., "Local Participation in Natural Resource Monitoring: a characterisation of approaches", 23 Conservation Biology (2009), pp. 1 et seq., at p. 31.

47 Decision 3/CMP.1, Guidance relating to the CDM, UN Doc. FCCC/KP/CMP/2005/3/Add1. December 2005.

tions.⁴⁸ Although there have been many methodological and technological advances since then, there are still justified concerns that REDD may not be an effective reduction of emissions given the capacity of many developed countries to undertake accurate forest carbon inventories on an ongoing basis, as would be required for any REDD scheme. This concern becomes even more important given the moves by many developed countries to allow unlimited or large volumes of international offsets (which would include REDD permits if they were part of a new international agreement) in domestic emissions trading schemes,⁴⁹ meaning that there is the possibility that most emissions reductions will come from avoided deforestation or sustainable forest management in developing countries, rather than from cuts in emissions in developed countries. This further increases the need to make emissions reductions from these sources real, demonstrable, transparent and verifiable.⁵⁰

Existing methodologies used by the Intergovernmental Panel on Climate Change (IPCC) and reporting principles developed by the UNFCCC will likely provide the basis for MRV in any REDD mechanism. The IPCC's *Guidelines for National Greenhouse Gas Inventories, Volume 4: Agriculture, Forestry and Other Land Uses (AFOLU)*⁵¹ and *Good Practice Guidelines for Land Use, Land-Use Change and Forestry (LULUCF)*⁵² will likely be particularly relevant. If forest degradation and sustainable forest management activities are to be included as eligible activities,⁵³ the most detailed approaches will need to be used for forest carbon estimation.⁵⁴

In calculating emissions or sequestration according to the IPCC AFOLU and LULUCF good practice

guidelines, activity data and emissions factors must be estimated or measured. In the context of REDD, activity data refers to the extent or area of deforestation or degradation. There are three approaches outlined in the guidelines, the third of which uses spatially explicit land-use conversion information. It is likely that any REDD mechanism will require land use changes to be identifiable and traceable in the future, making this approach the only suitable one to determine the activity data.⁵⁵

To measure emissions factors, a range of possible approaches is again outlined in the guidelines, with increasing levels of certainty and accuracy. Tier 1 involves using the IPCC default values, which provide a carbon storage capacity for each biome. Tier 2 requires some country-specific carbon data, and Tier 3 requires a national inventory-type data of carbon stocks in different pools, and an assessment of changes in those pools through repeated measurements or modelling.⁵⁶ For REDD, a combination of Tier 2 and Tier 3 will likely be required to measure degradation or increases in carbon stock from sustainable forest management.

Measuring activity data will require the use of satellite imagery and remote sensing data; currently, however, only a few developing countries have the data and capability to analyse and process satellite imagery to the standard required for REDD reporting.⁵⁷ Remote sensing technology also has limitations, in that it can not currently pick up changes in forest carbon stocks as a result of degradation, highlighting the need for additional effective ground-level measurement of carbon stocks,⁵⁸ in both establishing the baseline and then monitoring changes against this baseline.⁵⁹

48 Gibbs et al., "Monitoring tropical forest carbon stocks and REDD", supra note 2; John Niles, "Tropical forests and climate change" in Stephen Schneider et al. (eds) *Climate change policy: a survey* (Washington DC: Island Press, 2002); Raymond Gullison et al., "Tropical forests and climate policy" 316 *Science* (2007), at p. 985.

49 Carbon Pollution Reduction Scheme Bill 2009 (Australia); "American Clean Energy and Security Act of 2009, H.R. 2454, 111th Congress, 26 June 2009".

50 UNFCCC Decision 2/CP.13, supra note 18.

51 IPCC "Guidelines for National Greenhouse Gas Inventories, Volume 4: Agriculture, Forestry and Other Land Uses", 2006, available on the Internet at <<http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html>> (last accessed on 14 July 2009).

52 IPCC "Good Practice Guidelines for Land Use, Land-Use Change and Forestry", 2003, available on the Internet at <<http://www.ipcc-nggip.iges.or.jp/public/gpplulucf/gpplulucf.html>> (last accessed on 14 July 2009).

53 As has been indicated by the broad acceptance of REDD plus. UNFCCC Subsidiary Body for Scientific and Technical Advice, "Methodological Issues", supra note 4.

54 GOFC-GOLD, "Methods and procedures", supra note 8.

55 IPCC, "Guidelines for GHG Inventories", supra note 51; IPCC "Good Practice Guidelines for LULUCF", supra note 52; GOFC-GOLD "Methods and Procedures", supra note 8.

56 GOFC-GOLD, "Methods and Procedures", supra note 8.

57 Markks Kanninen et al., "Do trees grow on money: the implications of deforestation research for policies to promote REDD" (Bogor: CIFOR 2007).

58 Described as emissions factors in the IPCC AFOLU and Good Practice Guidelines for LULUCF.

59 Margaret Skutsch and Daniel Murdiyarso, "Lessons Learned", in Daniel Murdiyarso and Margaret Skutsch (eds) *Community Forest Management as a Carbon Mitigation Option: Case Studies* (Bogor: CIFOR, 2006); Gibbs et al., "Monitoring Tropical Forest Carbon Stocks and REDD", supra note 2.

The IPCC guidelines specify that carbon stocks in key categories, e.g. tree biomass for tropical forests, should be estimated using the higher tier methodologies (tiers 2 or 3). Generally, the lower the tiers, the more conservative the estimate; therefore, it would also be advantageous for countries to measure emissions factors using the higher-tier methodologies.⁶⁰ The largest carbon pool in most forests, and the one most directly impacted by sustainable forest management, is the aboveground living biomass (trees trunks, branches and leaves). Its estimation is therefore the most critical to accurately measuring the carbon stock in forests.⁶¹

Measurements of diameter at breast height (dbh) in combination with tree height can be combined with details of allometric relationships⁶² to give an accurate estimate of forest carbon stocks.⁶³ Allometric relationships do not need to be developed for each species, which may be difficult for tropical forests given the high species diversity. However, more generalised allometric relationships, stratified by broad forest types or ecological zones, have been shown to be highly effective for the estimation of carbon stocks in the tropics.⁶⁴ It is suggested that the effort and cost required to develop location or species specific allometric relationships may not be justified given that they will not improve accuracy of measurement.⁶⁵

Based on current IPCC good practice guidelines, and to ensure a sufficient accuracy in measure-

ments to engender international confidence in any REDD mechanism, it will be necessary to include a large amount of field-based data in countries' forest inventories. In order to accurately measure degradation in particular, forest carbon will need to be measured in a range of forest types, with various levels of disturbance and degradation, which is difficult and expensive,⁶⁶ and may be particularly difficult in some developing countries given the limited number of professionally trained foresters.

IV. Why Traditional MRV May Not Work in PNG

Typically, MRV involves the use of high levels of technology and highly skilled personnel to collect and analyse data within a scientifically designed and carefully planned program. The remoteness and difficulty of access that characterise many forested areas in PNG,⁶⁷ PNG's typically dense tropical forest types, and its high levels of poverty mean that traditional MRV approaches may not be appropriate or financially sustainable once initial donor funding for REDD capacity building ceases. Given the unique opportunity that PNG has to use REDD as a positive economic driver for sustainable forest management, it is essential that MRV be undertaken to the standard required in any international agreement; at the same time, the cost of MRV should not preclude communities from participating in REDD schemes. As noted above, the success of REDD will be highly dependent on the active participation of forest communities.

PNG does not currently report any carbon inventories to the UNFCCC, meaning that any monitoring for REDD would have to start from a low level of knowledge and baseline data.⁶⁸ Given this, PNG has been identified as a high priority for investment in capacity building in MRV, with currently some remote sensing capacity and limited carbon inventory capacity.⁶⁹ Indicative costs for ongoing monitoring programs in PNG were provided in the Eliasch Review,⁷⁰ with Tier 3 methodologies, accounting for degradation, likely to cost £952 000 in the first year, with an ongoing cost of £294 000 annually.⁷¹ These kinds of costs are out of reach of PNG without substantial international funding, and the ongoing cost may be prohibitive to the continued implementation of traditional MRV programs.

60 GOFC-GOLD, "Methods and Procedures", supra note 8.

61 Gibbs et al., "Monitoring Tropical Forest Carbon Stocks and REDD", supra note 2.

62 An allometric relationship refers to the relationship between the growth of part of an organism to the growth of the whole organism. E.g., in the case of trees, the relationship between an easily measured feature, e.g. diameter at breast height, and volume.

63 Gibbs et al, "Monitoring Tropical Forest Carbon Stocks and REDD", supra note 2.

64 Sandra Brown, "Measuring Carbon in Forests: Current Status and Future Challenges" 116 *Environmental Pollution* (2002), at p. 363.

65 Holly Gibbs, "Monitoring Tropical Forest Carbon Stocks and REDD", supra note 2.

66 Ibid.

67 Pat Hardcastle et al., "Capability and Cost Assessment of the Major Forest Nations to Measure and Monitor Their Forest Carbon for Office of Climate Change", 2008, available on the Internet at <http://www.occ.gov.uk/activities/eliasch/LTS_capability_and_capacity_m&m.pdf> (last accessed on 14 July 2009).

68 Ibid.

69 Ibid.

70 Ibid.

71 Ibid.

V. Why Community-Based MRV May Be a Better Alternative

Community-based monitoring is monitoring and reporting that is carried out at a local scale by individuals with little formal education. Local people are directly involved in data collection and analysis.⁷² There is often the need for support by local civil society organisations in training, servicing equipment and in data analysis, but the idea of community-based monitoring is that it is community-driven, and that trained community members undertake most of the work.⁷³

A fundamental requirement for sustainable forest management projects to participate in any form of REDD mechanism will be the need to demonstrate reduced levels of degradation, and therefore increased carbon sequestration and storage. The problem in most developing countries, including PNG, is that there is no pre-existing forest inventory with which to compare carbon storage capacity, due to the lack of forestry staff and financial resources. The use of local community members, with the correct training in standard forestry inventory protocols, can produce data that is as reliable as that produced by professionals, and can use indigenous knowledge to collect the forest inventory data. The relevant data can also be collected at much lower cost than if professional foresters were undertaking monitoring,⁷⁴ and there is great potential for additional benefits from active, ongoing participation in sustainable forest management by local communities.

PNG in particular has been identified as being appropriate for the use of community-based monitoring.⁷⁵ The particularly small number of trained personnel, difficult access conditions and the intimate knowledge and connection of customary landholders with forests make the country ideally suited for this approach. The benefits of using community-based MRV in developing countries generally and in PNG more specifically are outlined below.

1. Reducing the Costs Associated With REDD

Transaction costs involved in the development of REDD and other forestry projects are often significant. Given that high transaction costs reduce the carbon revenue that may be filtered back to

landowners and villagers, it is important to reduce these as much as possible to ensure that REDD is a real, economically viable alternative for communities. By using community monitoring and reporting of forest carbon stocks, the costs of MRV may be reduced.⁷⁶

The cost effectiveness of involving local communities in MRV is also supported by experience of small scale forest carbon projects under the Clean Development Mechanism. Research in this area suggests that transaction costs are minimised by including local communities in forestry projects, and through ensuring collaboration between NGOs and communities. This collaboration may be in a range of areas, including training to use participatory GIS systems to allow local people to undertake monitoring.⁷⁷

The Eliasch review estimates a variety of costs for capacity building, in PNG, including a first year cost of £396 000, using Tier 3 methodologies including degradation, and then a continuing annual cost of £132 000.⁷⁸ There would also be additional costs for remote sensing capacity building and data purchase. These cost estimates for the use of Tier 3 methodologies have not included the use of participatory community monitoring, and although initial start up costs for this type of MRV are likely to be significant, ongoing monitoring typically becomes considerably cheaper than traditional professional

72 Finn Danielsen, Neil Burgess, and Andrew Balmford, "Monitoring Matters: Examining the Potential for Locally-Based Approaches" 14 *Biodiversity and Conservation* (2005), at p. 2507.

73 Eliakimu Zahabu, "Sinks and Sources: a Strategy to Involve Forest Communities in Global Climate Policy", 2008, PhD thesis, University of Twente, available on the Internet at <<http://www.communitycarbonforestry.org/>> (last accessed on 14 July 2009).

74 Kyoto: Think Global, Act Local, "A Field Guide For Assessing and Monitoring Reduced Forest Degradation and Carbon Sequestration by Local Communities", 2009, available on the Internet at <<http://www.communitycarbonforestry.org/>> (last accessed on 14 July 2009).

75 Hardcastle et al., "Capability and Cost Assessment of the Major Forest Nations", supra note 67; Zahabu, "Sinks and sources", supra note 73.

76 Kamal Banskota, Bhaskar Singh Karky and Margaret Skutsch, "Lessons Learned and Future Directions" in Kamal Banskota, Bhaskar Singh Karky, Margaret Skutsch, (eds) *Reducing carbon emissions through community-managed forests in the Himalaya* (Nepal: ICIMOD 2007); Danielsen, Burgess, and Balmford, "Monitoring Matters", supra note 72.

77 Emily Boyd, Maria Gutierrez and Manyu Chang, "Small-Scale Forest Carbon Projects: Adapting CDM to Low-Income Communities" 17 *Global Environmental Change* (2007), at p. 250.

78 Hardcastle et al., "Capability and Cost Assessment of the Major Forest Nations", supra note 67.

monitoring.⁷⁹ When comparing the total lifetime costs, including training and support for local community members to undertake monitoring and data analysis and reporting, community-based monitoring costs considerably less than professional monitoring.⁸⁰ It is clear that PNG would still require significant international donor investment in capacity building, but by choosing to use community-based forest monitoring, ongoing costs associated with MRV could be reduced.

2. Developing Another Income Stream

As well as being a good way to reduce transaction costs,⁸¹ community-based monitoring also provides an opportunity for local people to provide a service, and to charge a fee for services to national governments or international REDD project developers. Given the ongoing discussions in PNG between landholders and the national government about benefit-sharing of REDD revenues, community-based MRV could be a very important way to increase the share of REDD revenue allocated to communities.

Alternatively, communities may wish to charge a fee for service for MRV services provided to national governments or international project developers to ensure an additional revenue stream that would be independent of the international carbon price. The reliance of poor communities on natural resources for security to cope with unexpected financial pressures may act as a constraint on their participation in forest carbon projects;⁸² however, monitoring as an additional income stream may assist in alleviating some of this pressure. MRV rev-

enue may be an effective way to increase the revenues from REDD for communities, making it a real economic alternative to current forest management practices.

3. Further Engage the Community

The success of any natural resource management activity and associated monitoring in a developing country relies on local communities playing a central role throughout the project, and requires clear social and financial incentives to be built into the projects as incentives for continued participation.⁸³ The use of local communities to undertake MRV for REDD projects, and the potential to charge national governments for this service, provides this incentive for them. This additional financial benefit may be particularly important, given that the market price of REDD credits may not be greater than the opportunity cost of participating in any REDD scheme.

More generally, there are numerous advantages of participatory, community-based monitoring, including enhancing local commitment to the project and enabling rapid identification of threats so that prompt action can be taken. The involvement of the community can also make long-term conservation measures more effective, as it raises awareness and pride in the conservation project, encouraging communities to take part in the project, while at the same time minimising the threats to the project.⁸⁴ REDD projects will require a long-term commitment, understanding and implementation of obligations for communities, and involving communities in MRV is a good way to increase their understanding and on-going support for projects.

Data derived from local communities also has many benefits in terms of ongoing community support for projects. These include improved collaboration and communication between local stakeholders and government authorities, enhanced awareness, education and attitude towards environmental sustainable practices, increased compliance with regulations, the ability to include local and indigenous knowledge into government programs, and empowering communities to manage local resources.⁸⁵

The Eliasch review identified a long-term potential for more community engagement in management and control of forests in PNG, but also identi-

79 Danielsen, Burgess, and Balmford, "Monitoring Matters", *supra* note 72.

80 *Ibid*; Zahabu, "Sinks and sources", *supra* note 73.

81 Skutsch and Murdiyarto, "Lessons Learned", *supra* note 59.

82 Boyd, Gutierrez and Chang, "Small-Scale Forest Carbon Projects", *supra* note 77.

83 Mikkel Hooge Holck, "Participatory Forest Monitoring: An Assessment of the Accuracy of Simple Cost-Effective Methods" 17 *Biodiversity Conservation* (2008), p. at 2023; Gerald Murray and Michael Bannister, "Peasants, Agroforesters, and Anthropologists: a 20 Year Venture in Income-Generating Trees and Hedgerows in Haiti" 61 *Agroforestry Systems* (2004), at p. 383; Boyd, Gutierrez and Chang, "Small-Scale Forest Carbon Projects", *supra* note 77.

84 Hooge Holck, "Participatory Forest Monitoring", *supra* note 83.

85 Danielsen, Burgess, and Balmford, "Monitoring Matters", *supra* note 72.

fied that it would require a large amount of capacity-building. The report identified local civil society organisations as comprehensive, competent and effective,⁸⁶ and as able to contribute to capacity building, particularly in local communities.⁸⁷ This would further engage not only landholder groups in the REDD process but also civil society groups, who have had difficulties to date in providing input into the national government's REDD framework in PNG.⁸⁸

4. Addressing Capacity and Governance Issues

A number of case studies show that local communities, with appropriate training, are able to undertake both baseline monitoring and ongoing monitoring of changes in carbon stocks reliably and accurately.⁸⁹ For ongoing monitoring of growth rates, and therefore carbon sequestration, local communities have been able to provide accurate data at much lower costs than professionals⁹⁰ and to avoid the issues of corruption, and poor governance that have hampered efforts to monitor and enforce forestry laws in PNG to date.

Community monitoring has been found to be effective following training on basic forest mensuration techniques, and in the use of relevant equipment such as handheld computers with GIS and GPS systems. Community members were able to accurately map the boundaries of and strata in forests and use standard forestry inventory methods from which data is entered into a specially designed computer database, despite low levels of education and little prior experience.⁹¹ A detailed case study undertaken in Tanzania in developing a field forest inventory guide⁹² indicated that, despite a few difficulties encountered in the training, villagers were able to perform most of the important steps outlined in the field guide, with the support of local organisations. The knowledge of local people was also very important in the success of the guide, as they were able to capitalise on their long-term experience and knowledge of the forest, which external professionals are unlikely to have.⁹³ This approach, which may seem to be based on high levels of technology, and therefore be inappropriate for local villages, has proven to be well suited to local conditions in a range of countries.⁹⁴ The extreme isolation in some forest communities in

PNG may create access problems for NGOs involved in training communities and supporting data analysis, yet these problems of access and remoteness would be exacerbated if MRV was undertaken by professionals, making community-based monitoring even more appropriate in these situations.

Testing of the field forest inventory guide has also been done with local communities in PNG, as part of the Kyoto: Think Global Act Local (K:TGAL) project. This demonstrated the need for some alteration of the local guide to reflect different local conditions,⁹⁵ however also demonstrated the applicability and success of this guide and community forest monitoring in PNG.⁹⁶

Independent, professional verification of the results obtained by villagers using the K:TGAL project field forest inventory guide showed that there was no significant difference between the estimated average carbon stocks when measured by the villagers or by the professional. There was, however, greater precision in the estimate of the professional, something which could be increased in the villagers measurements by increasing the sampling intensity.⁹⁷ This greater required sampling intensity is being incorporated into future editions of the guide.⁹⁸ These results indicate that the use of community-based MRV obtains results consistent with

86 Hardcastle et al., "Capability and Cost Assessment of the Major Forest Nations", supra note 67.

87 Ibid.

88 Personal communication with the PNG Eco-Forestry Forum (EFF), Environmental Law Centre (ELC) and Centre for Environmental Law and Community Rights (CELCOR).

89 Skutsch and Murdiyarto "Lessons Learned", supra note 59.

90 Ibid.

91 None of the villagers had any more than 7 years of primary education, and none had used a computer before. Daniel Murdiyarto, and Margaret Skutsch, "Promoting Carbon Benefits From Community Forestry Management", in Daniel Murdiyarto and Margaret Skutsch (eds) *Community Forest Management as a Carbon Mitigation Option: Case Studies* (Bogor: CIFOR, 2006).

92 As part of the "Kyoto: Think Global Act Local" project.

93 Zahabu, "Sinks and sources", supra note 73.

94 Skutsch and Murdiyarto "Lessons Learned", supra note 59.

95 For example, as the forest floor in PNG tropical forests is generally open and the rate of decomposition is very high, the contribution of litter to the total carbon stock is relatively low, therefore the measurement of this biomass pool is not recommended. Zahabu, "Sinks and sources", supra note 73.

96 Ibid at Appendix 7.

97 Ibid.

98 Ibid.

other methods of monitoring, and therefore would be able to comply with requirements consistent with the current IPCC good practice guidelines and it is anticipated, future REDD MRV requirements.

VI. Legal and Administrative Requirements

The specific inclusion of community-based monitoring in the international legal regime is not necessary for its implementation at the domestic level, and we suggest that the international legal regime should not be overly prescriptive as to how MRV should be undertaken. While it is important for the international legal regime to set minimum standards for MRV, including the accuracy and completeness of data used in emissions reductions estimations, the decision as to how to achieve these minimum standards of accuracy and completeness should then be the decision of individual States. It is important however, that these minimum standards do not preclude the use of community based monitoring, for example through specifying unattainably high levels of precision and accuracy, or specifying particular techniques requiring high levels of technology and expertise.

Primarily, community-based MRV will be nationally based. At the national level, community-based monitoring, if chosen as appropriate, should be rooted in a legal regime governing REDD projects. This legal regime should outline where community-based MRV will be used, the rights and responsibilities of communities participating in any such program, as well as any additional fee for service arrangements if communities chose to undertake MRV. It is particularly important for transparency and good governance that these arrangements are underpinned by legislation.

Administratively, community-based monitoring will require decentralised government or NGO support for training and ongoing assistance to communities undertaking MRV. In addition, national level government support for the use of community-based MRV and recognition of the data produced

will be necessary. The effectiveness of NGOs in providing training and community support is exemplified by the Kyoto: TGAL Project.⁹⁹ These types of partnerships and training materials should continue to be developed with materials further refined with additional field testing, including scientific verification of data produced, in a range of environments. It is anticipated that methods and techniques used in community-based MRV will continue to develop as it becomes more widely supported and used.

VII. Conclusion

Community-based monitoring could potentially play a key role in enabling developing countries to fully participate in any REDD mechanism and maximising the benefits distributed to forest-dependant local communities. In this context, it is necessary to ensure that current capacity-building efforts adequately consider community-based monitoring programs. As MRV is a crucial component of REDD, innovative methods of MRV that include co-benefits, as described in this paper, should be incorporated into national and international MRV discussions.

In PNG, community-based monitoring could address both of the key drivers of forest loss. The current problems of capacity, resource shortages and governance that have hampered forest conservation efforts to date may be addressed through community-based MRV, avoiding the closed, centralised approach which has so far attracted stern criticism of the government. Given the current uncertainties in PNG regarding benefit sharing, this could be particularly important in encouraging communities to participate in REDD schemes and ensuring that REDD projects are seen as legitimate at the community level,

Community-based monitoring may also provide a solution for the forest communities forced by poverty to consume forest resources at unsustainable rates. By providing an additional income stream, community based MRV has an important role to play in making REDD an economically viable alternative to current unsustainable forestry practices.

99 RECOFT, "Kyoto: Think Global Act Local Project", supra note 9.