

The Economic Status of Resources in PNG

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Papua New Guinea is well endowed with extensive natural resources, but currently remains a poor developing country with an unsatisfactory development performance, low social indicators by world standards and the worst in the Pacific region, and growing income disparities. It has some natural development handicaps, notably geographical - related to the high costs of land and sea transport, and some historic, but poor planning and unsatisfactory leadership and governance over recent decades are the primary causes of its poor progress, in relation to potential.

Although PNG is undeniably resource rich, exaggerations of these assets and prospective discoveries are sometimes propagated and regularly undermine any resolution by government to make, and stick with the reforms needed to put the development process on a more sustainable footing. There's always a new resource project or commodity price rise as an excuse for leaders to duck the harder choices. Resource exaggerations stem from a range of sources, including a few companies seeking to tantalise investors and boost share prices, by cargo cultists and carpet baggers (both international and local) and by some intending leaders when promising untold wealth, seeking extortionate deals with government or urging unrestrained expenditure.

Sitting on the edge of two major plates, in a geologically unstable and complex belt, PNG has been provided extensive, though implicitly exhaustible, mineral resources, both on land and beneath the sea. These include copper, gold, nickel, plus fossil fuels, including modest quantities of oil and greater amounts of natural gas on the southern flanks of the main cordillera. The country has been extensively surveyed geologically since the 1880s, and more rigorously over the past 30 years, including using the latest helicopter-based geophysical survey techniques and the submarine exploration, particularly for gold, now being undertaken by Nautilus mining.

Although specific major deposits have already been exhausted, or substantially exhausted, including for copper, gold and apparently much of the known reserves of oil, other significant mineral deposits have been long identified, or in a few cases, as with submarine resources, discovered more recently. These are often in highly inaccessible locations on land or offshore, and potential developers have been biding their time until improved prices or technology and further resource verification may justify the high cost of commercial extraction. In most cases these would entail small to medium scale operations, rather than vast mines, like Ok Tedi and Panguna for copper and gold or Porgera and Lihir (for gold).

Mining and, since 1992, the extraction of hydrocarbons, are immensely important to PNG's economy. Combined their K10 ½ billion of exports in 2006 provided about 83% of the country's export earnings (up from 75% in 2004), with copper alone from the problematic Ok Tedi mine providing 34% of our export earnings, followed by gold, then crude oil, each at around 24% of earnings for 2006. The sector provided

more than 30% of government revenue over the decade to 2004, and the bulk of the subsequent increase. Company tax receipts grew roughly 2 ½ times from 2004 to 2006, from 32% of total tax receipts in 2004 to 51% of the K5 billion tax revenue in 2006. The bulk of the 21% increase in total revenue from 2005 to 2006 was provided from the sector. This enabled the hitherto un-forecast “windfall” revenue contained in the 2006 and 2007 budgets, and the planned funding for a backlog of infrastructure and other priorities. The mining and petroleum sectors have certainly provided an increasing backbone of revenue to enable government and some provincial authorities to perform their functions, if they have the capacity and inclination to do so.

Ok Tedi alone paid K1.4 billion in taxes and duties till 2004 and Porgera K170 million in 2004 alone, even before the recent commodity price hike. That’s apart from the hundreds of millions paid in royalties to provincial governments and local communities, and similar sums in dividends paid to government from projects like Ok Tedi. However, whilst the mineral sector is likely to provide long term revenue and export earning for PNG, recognising market volatility and shorter-term “windfalls”, individual mines are inevitably limited in duration, and maximising lasting local benefits and minimising their disruptive impact are the major challenges.

The huge expansion of demand for raw materials in East and latterly South Asia, notable China and now India, has pushed commodity prices up dramatically over the past couple of years, with a 46% increase in the weighted average kina price of minerals exports from 2005-2006 alone, which was in turn up from the previous year. This particularly affected the oil and mining markets, but also a few agricultural commodities like natural rubber, now enjoying (like nickel) a record price from increased Chinese vehicle ownership. Mining and quarrying provided an estimated 15% of GDP during 2006, and oil and gas an estimated 13.6%, or nearly 29% combined, well up from 18.5% recorded for 2002, when commodity prices were markedly lower. Whilst prices for some resources will undoubtedly remain higher than historic levels, in response to changing supply and demand conditions, it should be assumed that prices of some of these commodities will at least level off as Asian economies’ growth shift to more sustainable levels, increasingly addressing bottlenecks and some of the downside of their rapid growth.

Papua New Guinea is also well-endowed with so-called renewable resources, notably extensive fertile lowland and highlands agricultural land and other terrestrial resources, including extremely bio-diverse natural rainforests. With its range of productive highland and lowland conditions the country is capable of producing an extensive array of agricultural crops and other products, normally without the need for irrigation or significant other external inputs. With evidence of cultivation stemming back some 9,000 years in PNG, there is considerable accumulated knowledge of agricultural systems, with a diversity of locally domesticated and adapted plant species, some of which, such as sugar cane, having spread internationally. It should be recognised, however, that there are tangible agricultural production constraints, for example in areas already experiencing high population pressure, and that much of PNG’s rainforest areas would be unsuitable for intensive agriculture, suffering from rapidly declining fertility if the tree cover is removed. [Tree crops providing the nearest replacement in ecological terms, including potential use of some native species, such as galip (canarium)].

Long the backbone of the economy and provider of food and other basic needs for the population, agriculture has seen its contribution to GDP relatively decline over recent decades, including over the past few years following the recent leap in mineral commodity prices, slipping to an estimated 34% in 2006 (although it must be recognised that calculations for the non-monetised part of the economy are relatively crude).

Although more or less keeping pace with (though not fully meeting) increased domestic demand for staple and other food needs, agricultural export production, as with much of the sector, has been relatively stagnant since the late 1970s, and declined to about 20% of total exports (by value) in 2005 and to 15% in 2006, when record mineral prices further boosted the dominant role of mining and oil.

Oil palm has bucked the poor agricultural performance to overtake coffee as consistently the major cash crop, annually exporting over K400 million of crude and refined produce. This has resulted from the relatively sound prices for oil palm and the long term commitment and relative efficiency of the industry in PNG, particularly its investment in research and limited dependence upon the government's weak institutions. As a result NBPOL's parent company, for example, now sees PNG as its most competitive and preferred investment destination for oil palm.

Long seen as a pariah by environmentalists for its extensive dark monoculture and the mass forest burning in Borneo, the oil palm industry in PNG has made considerable progress, despite some notable glitches, to establish positive social and environmental credentials, including limited use of chemicals, improved waste management, rules restricting forest conversion and improved outgrower pricing arrangements. The industry's name in PNG has been undermined, however, over the past 15 years by a succession of proposed logging schemes, introduced in many cases by unscrupulous businesses, sometimes with political connivance, masquerading as oil palm, agro-forestry or infrastructure development, to avoid the requirements for forestry projects under the 1991 *Forestry Act*. The oil palm market is large and steadily expanding and PNG's industry has strong prospects, but to ensure that current voluntary standards (ISO 14001) are progressively enhanced and applied firmly by current and other prospective investors, requires, as in other industries, such as forestry, a commitment by the country's leadership and, where necessary, pressure from the wider community, including for appropriate land-use planning, within the constraints of customary land tenure.

Coffee had a bad production year in 2006, ameliorated partly by good prices. Cocoa has been making a comeback, exporting K200 million of crop in 2006, driven by sustained reasonable prices, the need for income and recovery in Bougainville and donor support. However, cocoa is now severely threatened by pod borer, and, as with other crops like coffee, highlights the need for crop diversification (and good research and quarantine safeguards) in PNG to safeguard the sector's subsistence and commercial future.

Some relatively minor crops, like vanilla, have periodically burst on to the scene when world prices have burgeoned, following supply constraints overseas, but their local production has dropped back with the inevitable subsequent fall in market prices. PNG's considerable agricultural potential and prospects for rural development are restrained by a wide range of macroeconomic, infrastructure, governance and

market constraints, which require concerted rather than piecemeal action to address. The recently approved National Agricultural Development Plan (NADP) is a step in the right direction, but still sees the sector in terms of a series of government-led projects, rather than the need to identify and address wider constraints to business (in most cases small business) and investment.

Log and semi-processed timber exports have grown substantially in recent years, as they did in the early 1990s when world prices jumped and PNG's tax rates were very low, providing logging companies extraordinary profits. Recorded exports have more than doubled from the beginning of this decade to nearly 3 million m³ in 2006 (recorded at K520 million), thanks to improved prices and approvals of new concessions over recent years. With a generous reduction of log export tax in the 2007 Budget, (with no apparent quid-pro-quo, at least in terms of improved resource management) we can expect further production growth in forthcoming years. This has been a favourably treated industry in recent years, with limited enforcement of rules and agreements (as highlighted by the recent government-commissioned independent reviews) or requirement to register even average international market prices.

Although a few operators or prospective operators may be seeking to fulfil sustainable criteria and meet higher operating standards, projects are not currently being managed sustainably, nor generally to standards which would enable early resource recovery. Projects are also not providing satisfactory benefits to the country nor longer-term opportunities for resource owners. As indicated in the independent review, however, with limited rural options, few landowners would forego the option of harvesting their forestry resource, if that was their only significant local income-earning and employment option. Most landowners (especially women) sought less negative impact, compliance with local agreements, acknowledgement of local concerns and more tangible benefits (in terms of employment, durable infrastructure and services).

In seeking to provide more landowner options in future, including conservation and carbon sequestration, all interested stakeholders (including government, NGOs and the international community) must give more recognition of these local needs and opportunity costs. Lack of a current inventory of forest resources, at both national and project levels, has undermined the PNG Forest Authority's capacity to plan and monitor operations and sustainability requirements, so the long-awaited satellite-based resource assessment to be released imminently from UPNG's GIS centre will provide much needed information and be a valuable tool for foresters and other professionals, and the wider community.

The country also has rich coastal, reef and (unusually for the tropics) pelagic marine resources, notably including the world's largest remaining tuna stocks. Marine inventories are notoriously hard, especially with pelagic stock, but, with increasing pressure from international fishing fleets targeting the Western Pacific resource, two tuna species are already considered significantly over-harvested, whilst all other species, except skipjack, may also now be over-harvested, as catch levels recently seem to have nose-dived across the region, rather than just locally. International cooperation is essential in managing these resources in the best interest of all stakeholders. This requires a readiness by producing and consuming nations and industry to make significant concessions, and overcome the temptation by fishing operators and nations to cheat at the expense of others (the recurring 'tragedy of the

commons' syndrome), and overcome practical oversight difficulties undermining positive rhetoric. The benefits to PNG and its neighbours from these pelagic marine resources have remained limited, with a willingness to be short-changed in bilateral agreements.

Except during El-Niño years, PNG also has abundant supplies of flowing fresh water, adequate sunlight and seasonally steady wind conditions to meet various needs, including providing major renewable energy options. There have been suggestions that competition and future international conflicts will arise over access to an increasingly scarce resource, clean H₂O. As PNG has this valuable natural resource, though with climate change there are indications that its supply may be less consistent, there are two responses:- firstly, to make it available directly to others, which would probably be prohibitively costly, or alternatively to use it here to produce and supply the agricultural or other end products (including perhaps energy) needed elsewhere, i.e. to become a food-bowl for less endowed nations. This may require the terms of trade shifting in favour of agriculture, including vis-à-vis PNG's booming mining sector, and reduced agricultural protection in developed countries (including less rigid import restrictions into Australia).

A further natural resource, which has been relatively untapped to date, has been PNG's magnificent and diverse natural and cultural heritage (including its considerable biodiversity) which provide a strong basis for a much more substantial tourism industry than now, including valuable adventure and more specialist niche markets, as well as opportunities from science and bio-prospecting. The world is now finally becoming more aware of PNG and its uniqueness (for example, I know of three BBC film teams coming here this month alone for separate natural history and cultural series, as well as prospective National Geographic and Italian film crews). We need to capitalise on this growing global interest and seriously address the various constraints to tourism, notably security issues, limited competition and affordable or reliable communications and other services and encourage investment in training and suitable facilities. It is important that we recognise our market, namely eco and adventure tourism, not mass-tourism, and avoid undermining the country's natural attractions or dragging its destination reputation downmarket, for example with seedy gambling or other such commercial ventures.

Since Independence, despite positive rhetoric about agriculture, the mining, oil and gas sectors have held central focus in the minds of successive governments, with agriculture and its needs, such as good rural infrastructure and services, taking back-seat, particularly with the collapse in local administration and services. Tourism and its needs and potential for many years were ignored as irrelevant or even actively opposed!

PNG has provided a fairly typical scenario of what has become widely termed the "Dutch Disease", entailing a boom in one sector apparently undermining the prospects of other sectors and even the whole economy. The Dutch Disease has generally been associated with a booming oil and gas sector, as in the case of the Netherlands in the late 1960s and most notoriously Nigeria over recent decades, or, locally, Nauru. Its prevalence in economies with apparently dominant mineral sectors encouraged the term "resource curse", particularly as many countries with strong mineral resource bases seemed to perform worse than less well-endowed nations, as in East Asia. The

latter countries tended to develop through economic discipline, strong social capital and targeted investment, notably in education and human resource capital, rather than having a strong natural resource base.

The possession of a strong mineral resource base should not, however, necessarily be a curse in itself, and many developed countries -such as Norway- and a few developing countries, notably Botswana (with a resource base sometimes compared with PNG, but years of strong growth against PNG's sluggishness), have demonstrated that, if the economy and the benefits stream, whether from resources or aid, are managed wisely, they can indeed be a blessing, whilst recognising that they will invariably have some impact on the composition of the economy. Nevertheless, in practice, in PNG and many other countries, the benefits of the oil and mining sector (and less transparent industries like logging) have been poorly managed by successive National and provincial governments, and local elites, with the boom sector undermining the prospects of other sectors, and particularly tradable goods and services (including agricultural export production and import replacement).

With agriculture and related activities generating the majority of employment and dispersed income-earning prospects in PNG and most other developing countries, in contrast to the relatively enclave and transitory mines and oil fields, it is critical to sustain agriculture's viability, at least until tangible alternatives may become available to absorb the workforce. The provinces where oil and mining apparently have had the most negative impact have been SHP and Western Province, where despite their relative wealth, rent-seeking has become a dominant force and infrastructure and services have been amongst the worst in the country. It has sometimes been suggested that Enga has (arguably) handled its resource revenue better, with more effective investment in infrastructure and services, notably education

This Dutch disease typically entails driving up exchange and wage rates, to levels only affordable by the boom and related sectors, encouraging imports of tradable goods and services, including agricultural products, and closing non-boom industries. This is generally exacerbated by lax fiscal restraint, spending freely rather than saving or investing in priorities, and possibly even borrowing ahead of forecast revenue. With weak institutional and capital markets, income from the boom sector is rarely invested in other sectors, except urban real estate and services, further encouraging urban drift through a push-pull effect, despite inadequate urban opportunities.

Most mining and oil companies have recognised the need to reinforce, and where necessary by-pass the deficient and in places failed government system if public goods are to be delivered, and potential antipathy allayed in local communities. The introduction of tax-credit schemes, futures trusts, and to some extent the establishment of the PNG Sustainable Development Program, reflected the need to ensure, not only longer term local services and other benefits, but also investment back into sustainable economic activities, including agriculture, plantation forestry and infrastructure and utilities. The recently established company, Petromin, although owned by government, may share some of these same objectives, but it will certainly need to demonstrate its credibility, capacity to take a longer term perspective and freedom from political and operational interference.

PNG Government planners, if not individual politicians, were to some extent aware of the risks of the Dutch Disease from the early days, and introduced some of the necessary measures to mitigate the boom and bust syndrome, such as the Mineral Resources Stabilisation Fund (MRSF), but the Government then proceeded to abuse the fund and other systems when so inclined. In the early 1990s, when oil and various new mining ventures were about to commence production, a major preparatory effort was undertaken to diversify the economy, under the title of “towards the minerals boom”.

Unfortunately, the high expectations, which encouraged loose expenditure and borrowings (and attracted half the world’s comen to Port Moresby), coincided with the loss of Bougainville revenue (exceeding that from the new projects) and an unprecedented fall in agricultural prices, resulting in the forecast revenue flow being blown before it even arrived, exhaustion of foreign exchange reserves in 1994, together with a rapid growth in corruption and income disparities in the community. The budgetary and foreign exchange crisis triggered supplementary budgets, the second structural adjustment programme and the devaluation of the kina, under the Chan government, which provided some relief to the agriculture sector and advanced the inconsistent process of economic reform.

The economic and governance reforms of the Morauta government from 1999, including separation of monetary management to the central bank, combined with the fiscal restraint, debt management and relative stability of the recent government, provided some enhancement of general investment conditions, with current low inflation, interest rates, etc., although the improved conditions for the mining sector introduced in 2003, and lack of parallel progress for other sectors, despite the rhetoric of the “green revolution”, tended to further reinforce the economic divergence, or dual economy.

Some academics, such as Dr Rod Duncan this year, have strongly questioned the net value of the mining sector to the PNG economy, on the basis of undermining wider economic prospects, arguing that it was unrealistic to expect, as he claimed last year’s NZIER/INA agriculture report did, the central bank to be able to counter upward exchange rate pressure, particularly under a floating exchange rate regime. Nevertheless, as the report NZIER/INA highlighted, there are various ways that the Government and the central bank can move to reduce overall constraints to sustainable agricultural and rural development, if they show the resolve and willingness to tackle sacred cows.

Pursuing longer term fiscal goals, whilst maintaining restraint, and applying firm reforms to improve public sector implementation capacity, cut waste and corruption, target priorities and enable the private sector to provide goods and services competitively, would encourage the economy to diversify and growth become more sustainable. Such reforms cannot make the agriculture sector automatically competitive, but would reduce costs and improve opportunities, particularly for the more committed and efficient. But if recent progress and restraint lapses and further reforms continue to be sidestepped, then much of the rural sector’s prospects will remain grim, in an increasingly competitive global market. Maybe we could take some lead from New Zealand, which found taking the medicine apparently worked. Removing institutional straight-jackets (including taxes on inputs) and encouraging

competition to provide affordable and reliable services, succeeded in turning around New Zealand's formerly sluggish and uncompetitive economy, including its dying agriculture sector.

A plausible argument has been expressed (e.g. by Sven Wunder) that a booming mining sector helps safeguard the natural forest from rampant destruction. This may hold some truth, including in relation to agricultural conversion, but unfortunately it particularly undermines plantations and sustainable forest management particularly (including community-run eco-forestry), which could generate needed income and employment opportunities. When log prices are high, and various ways available for minimise production costs, for example by failing to comply with standards, minimising wage costs (including using cheaper overseas labour) and transfer pricing to minimise taxes, logging can be extremely lucrative, particularly where it is merely extractive, with sustainable harvesting not applied, regardless of any boom in other sectors.

If one produced an overall balance sheet for PNG, using wider economic, social and environmental accounting, on an accrued basis, (an exercise which has been undertaken if crudely for some countries), it would show the progressive reduction of available non-renewable resources, notably mineral deposits, whilst adding new discoveries; show the depletion or degradation of forest and some marine resources through over-harvesting, poor management, agricultural or urban conversion, or factors such as fire and climate change; it would add new capital, such as (the few) agricultural or forestry plantations or smallholdings producing on a sustainable basis, and other productive assets; it should also reflect the short or longer term external costs, such as damage to the Fly and other river systems, transfers retained in the country, including the proceeds in the form of taxes, special support grants and royalties made to the State and resource owners, and reflect how that was used in terms of capital formation, including in infrastructure and its condition, in education and human resource development and how sustainable this is, or consumption.

Market economics is anthropocentric, in that it values resources in relation to their scarcity and demand or utility to humans. Some plants, rocks or, for example, insects may have no immediate apparent utility to man, so are given little or no monetary value. If they are inaccessible, located on Mars or in a remote swamp or mountain their utility, and hence value, is severely diminished to us. Yet, recognising a lag between scientific knowledge and market acceptance, these market valuations are highly dynamic, not more so than over recent years.

The values we place on resources will inevitably change dramatically in the next years and decades, as resources (such as fossil fuels, fish, clean water and air) are progressively exhausted or at a premium, new products, substitutes or ways of extracting useful compounds identified, tastes change, and the importance of hitherto overlooked physical, chemical or ecological forces and interactions, habitats or species become recognised.

Humans have arguably become more sophisticated and spontaneous in applying prices to directly purchasable products and services, taking into account current demand, scarcity and reflecting their cost of production or extraction. We are relatively crude at setting a value or cost, or enabling payment for what are considered

public assets or externalities, such as paying to retain clean air or a pristine island or a rare species, or avoiding climate change or managing waste (a cost often transferred to the wider community). In other words we tend to overlook full costs in our commodity or other pricing, and have inadequate mechanisms for paying for them, or for wider community, as opposed to individual, needs and wants, such as the gold from that island, or purported medicinal properties from some rare species.

Improved information and communications and more sophisticated modelling of these wider economic (social and environmental) impacts are now being developed and slowly incorporated into policy and taxation systems, sometimes ahead of the market. Whilst parts of the market, for example, have been ahead of some governments with respect to climate change, and made some reckoning for emissions or adopted opportunities from the growing carbon trade, much of the market, including households are apparently still hoping it's a figment of scientists' imaginations, not affecting property locations or prices or related markets.

Forecasting changing resource values remains largely crystal ball gazing, and fraught with uncertainty. Forecasts are invariably wrong, as unforeseen substitutes replace existing products, and technology, tastes and global populations and economies change. Demand is strong for many of PNG's mineral and other natural resources, and likely to grow, although these products may not necessarily be used for the same purposes as now. For example, with diminishing supplies of mineral oil and concern over greenhouse gases and demand for cleaner bio-fuels, demand for oil palm and copra may expand, diversify or even shift away from traditional markets, especially if the output is more suitable and requires less energy inputs than alternative crops, like maize. That, of course, poses other issues, for example related to potential increased pressure on food prices and hence food security, and being able to adequately protect other priority natural resources from excessive expansion of bio-fuel production, including our vegetable oils.

With its incredible land and marine bio-diversity, no doubt some of the products in great demand in future will be currently unknown or little known plant or marine species from PNG. We must rigorously research and minimise the prospects of our actions now, including through resource extraction, undermining prospective knowledge, biodiversity and opportunities in the future, whether, for example, from logging, heavy emissions or extensive underwater mining. We must also be ready to secure recognised patents or copyright of value to PNG as well as the research organisation or commercial investor. Whilst there has been great adaptability, and capacity to increase production, as in agriculture, this has largely been through utilisation of non-renewable inputs, such as fossils fuels and inorganic fertilisers.

Many of the world's renewable resources, such as fish stocks, have been severely over-exploited. Fortunately for PNG, most of its renewable resources still remain within or slightly over sustainable harvest levels. The science of determining and managing sustainability is still crude, but improving. As it is much harder to return to sustainable levels once one has already greatly exceeded them, than if we are still only slightly above, the sooner effective rectifying measures can be applied the better and easier the adjustment.

A major mantra for PNG must be to avoid jeopardising future economic prospects (and the population's future welfare and environment) by short-changing itself now, for short term (possibly exclusive and corrupt) gain, as with many of the misnamed "agro-forestry" projects, which have merely proven over the years to be log extraction projects under the guise of agriculture, avoiding proper forestry project planning and oversight. Likewise, hurrying to issue extra licences over PNG's marine tuna resources, on giveaway terms, when the regional resources of many species are already widely considered at, or above, sustainable levels is short-sighted, (even if driven by other considerations).

Over the years the country has often been short-changed from the extraction of many these resources, and in some cases has severely undervalued its resources, as with many of the distant water fisheries licenses and timber resources. This undervaluation is both in terms of the prices and revenue received, but also the limited local employment, skills development and wider business and economic benefits, or multiplier effects secured.

Some investors have been markedly more responsible than others, and some have made much greater and longer term contributions, but others have been short-term and fly-by night of nature. Much of the error is on the part of the State or its representatives, in granting special deals or exemptions for favoured investors, and failing to supervise projects and maintain required standards. We need to objectively assess proposed projects, utilising available tools and following long established processes, such as mandatory 'development forums' for proposed mining projects and cost-benefit analysis to examine whether a project is beneficial or a net liability to the overall economy and the local community.

Squandering the benefits of its natural resources through short term consumption, by resource owners and the State, including unrestrained impact of the "Dutch Disease", has further undermined benefits to the country. Future demand is likely to increase for PNG's products, with its relatively pristine environment and generally lush growing conditions potentially making it an increasingly valuable provider of healthy uncontaminated food products (from the land and sea), but also other industrial products from agriculture, including bio-fuel, rubber and timber products from forest plantations, which can be relatively concentrated, rather than spread unduly.

With new mechanisms being developed for enhancing energy output from certain biomass, various crops are likely to gain greater value, whilst the growing awareness of the critical role of tropical rainforests (and certain marine habitats) as carbon sinks, (as well as other biological and ecological aspects) is rapidly shifting its economic value towards conservation, or at least sustainable management rather than crude extraction, although market mechanisms need to be developed and refined to apply this effectively, as tangible and sustainable benefits to the resource owners and the State.

What is clear is that short term decisions to extract resources, often under highly concessional or exclusive arrangements, without adequate assessment of their current or potential value, is short-sighted, particularly if their extraction (including dumping of waste products) has extensive secondary impacts upon other valuable or potentially valuable resources and eco-systems, especially renewable resources able to provide

sustainable and long term utility (such as productive agricultural land, forests or unpolluted and productive water-courses and catchment areas or rich marine habitats – such as around here in Madang).

Economics values resources for their utility, which normally means their utilisation. Changing resource valuation ensures changing uses of these resources. In the past natural gas was burnt off to rapidly extract oil reserves, and recover investment costs of oil field development. Governments initially had to require oil companies to pump this gas back into the ground, before the market woke up to the gas's own implicit and increasing value. In the future the idea of simply burning the planet's limited oil reserves as fuel, when petrochemicals have so many other critical functions in modern products, will probably cause great dismay.

Increasing the efficiency of utilisation of resources will be critical to future economic development, including reducing current economic disparities. Better forecasting and more refined valuation of our natural resources will be critical, if inevitably remaining relatively crude, providing suitable market signals for invention and improved resource management. In some cases resource utility will entail leaving resources untouched until knowledge of their efficient utilisation has grown, or simply because the population of the planet decides that a beautiful tropical island has greater value left as such, than for the extraction of some attractive mineral, but of limited intrinsic value. These valuations are determined by utility to humans, applied through their supply and demand characteristics, including the capacity of the markets to effectively reflect wider social needs and priorities, rather narrow individual or corporate purchasing power.

The State has a major role to play in the process, including helping ensure the markets work fairly and efficiently, seeking to ensure positive long term and sustainable outcomes, rather than merely immediate needs and interests, and requiring an equitable focus to ensure that segments of the community are not marginalised from the development process. The State has a major role in ensuring widespread community participation through, making its institutions function cost-effectively to perform its core functions, of providing infrastructure, effective education and health services, law and order and various other tasks, such as applied research and quarantine.

Parliament and wider society, including the press, watchdogs and NGOs, have a critical role to ensure accountability by government and the private sector, to the community's wider needs, including honouring the Constitutional requirement to remember the needs of future generations and to safeguard the country's rich natural and cultural resources.