

The Papua New Guinea economy

Bob Warner and Anthony Yauieb

Papua New Guinea's modest recovery continues. GDP grew again in 2004 by 2.6 per cent. As in 2003, good weather and buoyant commodity prices played an important role: but last year showed signs of a broader base to growth, as the government's efforts on the deficit and debt management improved the overall business environment. The budget was in surplus, inflation fell, key interest rates eased and public debt fell relative to GDP.

There is little room to relax on the public finance reforms that are re-establishing control over waste and unplanned spending and helping to achieve good fiscal outcomes. But attention also needs to be focused on strengthening strategic and policy influence on spending plans, if public sector service delivery is to improve and progress made on the Government's medium-term development objectives.

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The Papua New Guinea 2005 Budget estimates that GDP grew by 2.6 per cent in 2004, following the 2.8 per cent expansion recorded in 2003. As in 2003, activities in the agriculture, forestry and fishing sector were responsible for a large share of that expansion (Figure 1). However, unlike 2003, the remainder of the expansion was not largely attributable to the mining sector. Construction, manufacturing, transport, storage and communication, wholesale and retail trade, and electricity, gas and water all grew by over 2.5 per cent and accounted for around a third of the growth in the year.

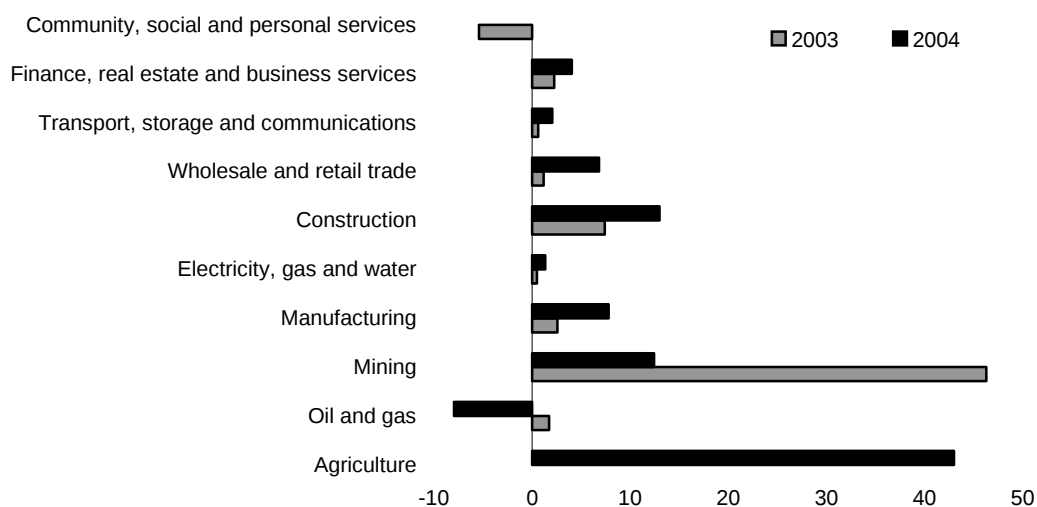
Buoyant export commodity prices and generally favourable weather continued to play a key role in this second year of recovery.

But the broader base of growth would seem to be also attributable to improvements in the business climate brought about by supportive fiscal and monetary policies, which created a benign inflation environment and an easing of interest rates.

In the mining sector, higher production of gold was expected to offset a small fall in output of copper, leading, along with a further increase in exploration activity, to a 3.3 per cent expansion in the sector (compared to 15 per cent in 2003).¹ Activity in the oil sector, in long-term decline, was expected to fall by 5.8 per cent.

In agriculture, increased plantation capacity allowed output of palm oil and cocoa to respond to good weather conditions,

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Figure 1 **Share of GDP growth by sector, 2003 and 2004** (per cent)

Source: Papua New Guinea, 2004. *2005 Budget Documents*, Government of Papua New Guinea, Port Moresby.

while higher world prices triggered a supply response in the cocoa sub-sector. However, while coffee prices improved slightly in 2004, export volumes fell 8.4 per cent, as the sector continued to be constrained by limitations on smallholder access to markets. (The poor state of the Highlands Highway and feeder roads, and the added problem of lawlessness played an important part in these constraints.)

Weather conditions did not favour logging activity and rubber production. The export of harvested logs was down 7.8 per cent from 2003—in part due to the moratorium on awarding of new timber concessions pending completion of a review of existing timber permits.

The manufacturing and services sectors together grew by 2.4 per cent, a much stronger performance than the 0.5 per cent expansion in 2003, responding no doubt to improved incomes in agriculture and improvements in

the climate for investment. The construction sector grew by 3.2 per cent, accounting for around 12 per cent of the total expansion in the economy.

Expanding economic activity triggered increases in private non-mining employment. According to the Bank of Papua New Guinea's index, average non-mining employment for the four quarters to September 2004 increased by 2.5 per cent over the comparable measure for 2003. The index suggests that employment in the mining sector grew by 4.6 per cent.

The external position of the economy was in surplus in 2004, led by a solid performance on the current account, which recorded a surplus of K334 million. Export volumes were down 6.4 per cent from 2003 levels, but this was more than offset by higher prices, so that total export values grew by 3.9 per cent to K8.2 billion.

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The boost to prices for mineral and crude oil was significant. Prices were nearly 15 per cent higher than in 2003. The average prices for copper and oil were 45.2 per cent and 21.6 per cent higher, respectively.

The value of imports grew by 11.2 per cent. This increase was largely a consequence of higher capital expenditure by the mining and petroleum operations, as general import demand remained subdued.

Table 1 Selected economic indicators, 2003 and 2004

	2003	2004
Real sector (per cent change)		
Real GDP growth	2.8	2.6
Mineral	11.1	0.9
Nonmineral	1.7	2.8
CPI (annual average)	14.7	2.2
CPI (12 months)	8.4	2.4
Central government budget (per cent of GDP)		
Revenue and grants	28.2	31.7
Expenditure and net lending	29.2	30.2
Overall balance	-1	1.5
Domestic financing, net	3.3	0.9
of which: banking system	-0.6	1.6
External financing, net	-2.4	-2.4
Privatisation, net	0.3	0.2
Money and credit (end-period per cent change)		
Domestic credit	-8.1	11.5
Net credit to government	-10.6	30.9
Credit to the private sector	-4.3	-1.7
Broad money	-0.9	19.9
Interest rate (182-day T-bills, end-period)	16.9	4.6
Balance of payments (millions of kina)		
Exports, f.o.b.	7,842	8,151
Imports, c.i.f.	4,231	4,703
Currents account	496	310
Financial account	-183	-18
Overall balance	353	334
Reserves and external debt (end-period)		
Gross international reserves (millions of kina)	1,731.3	2,066.1
(in months of non-mineral imports)	6.1	6.7
Public external debt service ratio (per cent of exports)	60	52.9
Public external debt-to-GDP ratio (per cent)	36.4	31.4
Exchange rates		
US\$/kina (end-period)	0.3000	0.3200
Nominal GDP	12,947.5	13,727.4

Source: Bank of Papua New Guinea, 2005. *Quarterly Economic Bulletin*, November, Port Moresby; Papua New Guinea, 2004. *2005 Budget Documents*, November, Government of Papua New Guinea, Port Moresby.

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The surplus in the overall balance allowed a continued build-up in international reserves to a level of K2.1 billion, sufficient for 6.7 months of non-mineral imports.

The contribution of policy

Money and prices

During 2004, inflation and interest rates fell and the external value of the kina remained fairly stable. The average increase in the CPI over the year was 2.2 per cent, compared to 16.6 per cent in 2003. The Bank of Papua New Guinea reduced its key indicator interest rate, the Kina Facility Rate, from 14.0 per cent at the beginning of 2004 to 7.0 per cent at the end of 2004. Further, yields on Treasury bills fell sharply across all maturities (so that the weighted average yield fell by 12.7 percentage points during the year, to 3.7 per cent at year-end). At the end of the year, the kina had appreciated by 6.7 per cent against the US dollar, and by 2.6 per cent against the Australian dollar.

Total money supply (M3) grew by 19.9 per cent over 2004, on the back of a 33.5 per cent growth in net foreign assets. Notwithstanding lower interest rates, credit to the private sector fell by 1.7 per cent as many firms repaid outstanding loans. There also seems to be a lagged response of investment to reduced cost of credit; part of this reflects structural impediments to investment and the lack of collateral to obtain loans. There was also a 'wait and see' stance adopted by many firms in relation to political and policy stability. The momentum may now be beginning to shift; for example there was a recent announcement by the Port Moresby Chamber of Commerce and Industry that 'up to K280 million of constructions projects were likely to be commissioned as a result of lower interest rates and renewed confidence in the economy'.²

Credit to the Government rose 30.9 per cent, reflecting the Government's efforts to increase the share of domestic debt in its debt portfolio. Also evident in the growth in total liquidity was a switch from term deposits to highly liquid assets, such as money and demand deposits, as interest rates fell.

The Bank of Papua New Guinea intervened during the year to prevent further appreciation of the kina. Figure 2 presents movements in an index of exchange market pressure over the 30 quarters to December 2004, which confirms that throughout the course of 2004 there was strong upward pressure on the external value of the kina.³ Central Bank intervention also helped to restrain the volatility of the kina, and in comparison to 2003, fluctuations in the US dollar-kina exchange rate were some 84 per cent lower.⁴

The benign inflation environment, coupled with a stronger exchange rate allowed the Bank of Papua New Guinea to ease monetary policy over the course of 2004. As a result domestic monetary conditions slackened progressively over 2004 (Figure 3)⁵. The easing of monetary conditions commenced around September 2003 and has continued unabated since.

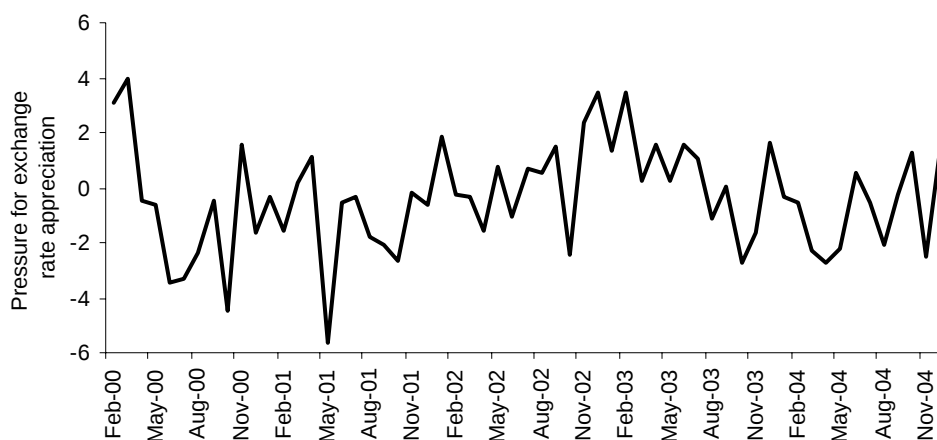
Revenues, expenditures and debt

Much of the improved economic performance in 2004 is attributable to the government's continued achievements in fiscal consolidation and debt management.

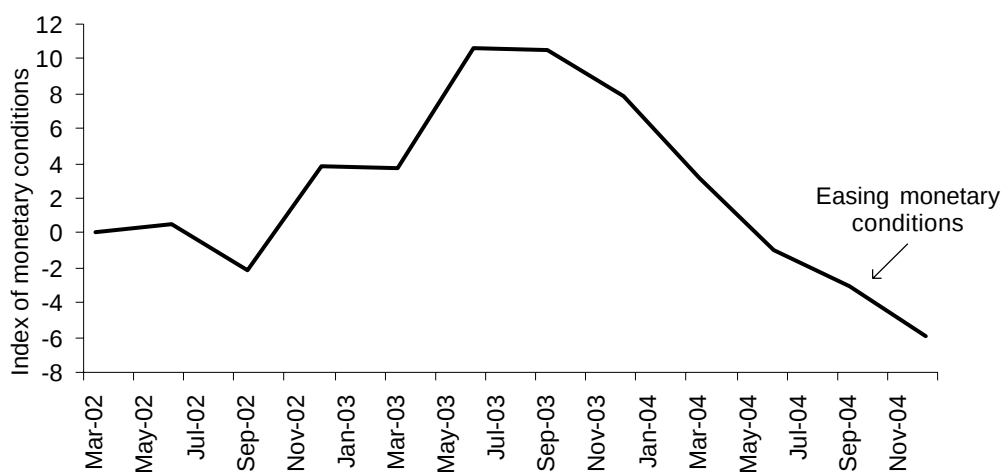
The fiscal strategy underlying the 2004 Budget aimed at

- reducing the stock of public debt to sustainable levels by 2007
- reducing the size of the budget deficit, with a target of 1.5 per cent of GDP set for 2004, followed by successive annual declines until budget balance is achieved by 2008

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Figure 2 **Exchange market pressure, 2002–04** (per cent)

Source: Bank of Papua New Guinea, 2005. *Quarterly Economic Bulletin*, November, Port Moresby.

Figure 3 **Index of domestic monetary conditions, 2002–04**

Source: Bank of Papua New Guinea, 2005. *Quarterly Economic Bulletin*, November, Port Moresby.

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- increasing control of public expenditure, with a keener focus on managing the wage bill
- redirecting spending towards the delivery of goods and services.

The outcome for the year suggests that the Government has had considerable success with regard to most elements of the strategy. The preliminary 2004 fiscal accounts show a healthy surplus equivalent to 1.5 per cent of GDP. This performance was driven by larger than expected receipts from mineral and petroleum related revenue and a large reduction in the interest cost of domestic public debt. By the end of 2004, the ratio of public debt to GDP had fallen a further 5.1 percentage points, to just under 55 per cent.

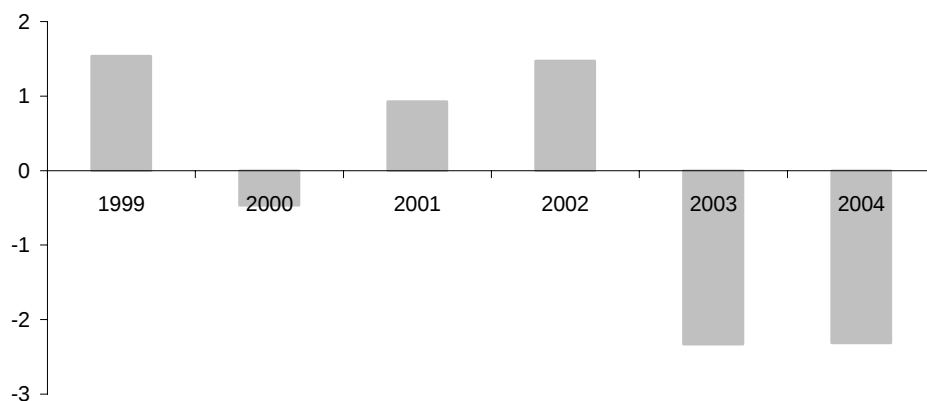
It is particularly creditable that the government has resisted the temptations created by revenue windfalls. Fiscal policy in the past has often been pro-cyclical, with fiscal imbalances feeding into balance of payments

difficulties and triggering boom-bust cycles. But over the past two years, as Figure 4 shows the stance of fiscal policy has been quite tight. (This figure presents a measure of the fiscal stance, the fiscal impulse, which tries to purge the effect of the economic cycle on the budget to see if discretionary policy has become looser or tighter.⁶ The negative value of the fiscal impulse shows that the fiscal stance has tightened, quite considerably, in both 2003 and 2004.)

Expenditures

Consistent with the provisions of the Public Finance Management Act, a considerable proportion of the above-forecast mining and petroleum revenues was used to retire debt. And some of the savings from the lowered cost of domestic borrowing were used to fund an increase in outlays and goods and services. However, some of these savings were also channeled into meeting an overrun on the wage bill (Table 2).

Figure 4 **Fiscal impulse, 1999–2004** (per cent of GDP)



Source: Bank of Papua New Guinea, 2005. *Quarterly Economic Bulletin*, November, Port Moresby; Papua New Guinea, 2004. *2005 Budget Documents*, November, Government of Papua New Guinea, Port Moresby.

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Table 2 **Public expenditure performance 2004** (million kina)

	2003 Out-turn	2004 Budget	2004 Out-turn	2004 Budget– out-turn difference
Salaries and wages ^a	1,122.2	1,152.7	1,322.8	170.1
Goods and services	634	659	858.2	199.3
Arrears and structural adjustment payments	30.3	68.4	67.1	–1.2
Interest payments	739.6	692.4	376.9	–315.5
Transfers to statutory institutions ^b	168.8	183.6	197.4	13.8
Development spending ^c	1,039	1,276.6	1,292.7	16.1
Total	3,773.9	4,032.6	4,115.2	82.6

Notes:^a This also includes leave fares, superannuation and retirements.

^b Plus net lending to CSAs.

^c This does not include infrastructure tax credit spending.

Source: Papua New Guinea, 2004. *2005 Budget Documents*, November, Government of Papua New Guinea, Port Moresby; additional data provided by the PNG Department of Treasury.

In total, public expenditure was K82.6 million above budgeted levels. Interest payments were K315.5 million lower than budgeted for, offsetting additional spending on goods and services of K199.3 million and an additional wage bill of K170.1 million. The stronger resource position was also used to fund a modest increase in development spending of K16.1 million.

The increase in personal emoluments was largely due to wage growth in the public service. A one-off payment of K650 to all public servants as well as a 4 per cent cost-of-living increase was paid in 2004. This modest increase goes some way toward reversing the steady erosion in the real levels of salaries and wages of public servants that has occurred over recent years. By delivering a significant proportion of the increase in the form of a one-off payment, the Government has limited the impact on the base for future wage negotiations.

(The wage increase does, however, cause concern about management of the wage bill in 2005. The 2005 Budget estimates a wage

bill of K1,294.6 million. Back-of-the-envelope calculations suggest that this provision may be insufficient by approximately K124 million, around 1 per cent of GDP.)

Better cash flow management during the year went some way to alleviating a recurrent problem caused by the backloading of disbursements of funding for goods and services. In the past, this has severely disrupted agency work programs and undermined service delivery. In 2004, cash allocations to spending agencies were disbursed through the year on a pro-rata basis, giving them greater certainty to plan and implement their programs. However, of the total spending on goods and services by national departments, over a third of it, K263.1 million, took place in December alone suggesting that budget implementation needs further improvements and refinements.

Another important factor contributing to the positive fiscal performance was the continuation of the current interim system of provincial grants. As the work of the National Economic and Fiscal Commission has

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shown, the formulae for determining grants to provinces built into the Organic Law on Provincial and Local-level Governments (OLPLLG) are quite unsustainable. The current interim system tries to address the imbalances built into the Organic Law and make the system affordable.

Debt management

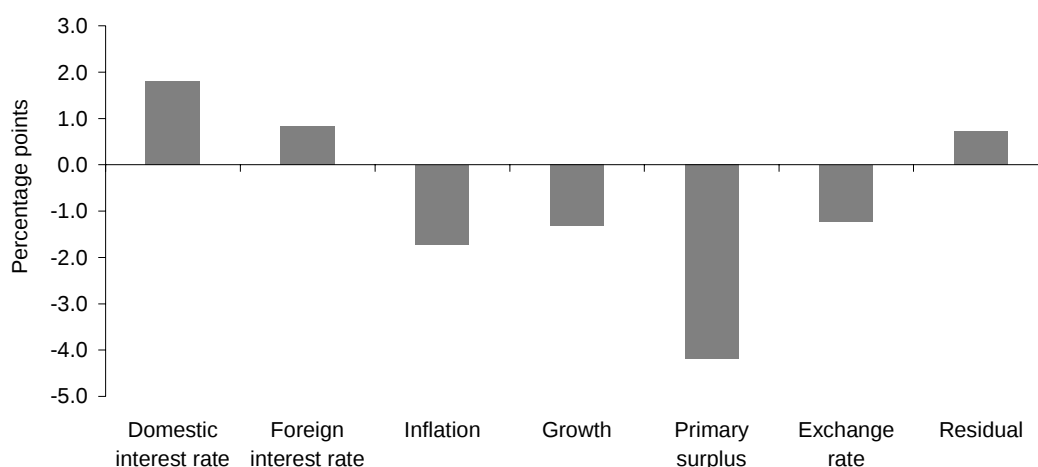
In pursuit of the goal of debt sustainability, the Government has followed a dual track of fiscal consolidation and debt restructuring.

The expansion of GDP, the appreciation of the kina, and the fiscal surplus have contributed to the reduction in the ratio of debt to GDP in 2004. (As the decomposition in Figure 5 shows, the strong primary surplus would have reduced the ratio by over 4 percentage points.) But the restructuring of the portfolio has had a big impact on the riskiness associated with the composition of public debt.

There was a brief flirtation during the early part of 2004 with large commercial foreign borrowing. However, this idea was eventually discarded in favour of the domestic debt program. If this commercial borrowing has been secured, it would have increased the foreign exposure of Government's liability side of its balance sheet. The kina value of the external stock of public debt is sensitive to exchange rate movements, which have been quite volatile since the kina was floated in 1994. For instance, between 2002 and 2003 nearly K2 billion was added to the kina value of external debt from exchange rate movements. From 2003 to end 2004, the kina value of external debt fell by K482.9 as a result of the appreciation of the kina.

The restructuring of the portfolio of Government debt is taking place on two fronts. The first aims at increasing the share of domestic debt to around 60 per cent. The basis

Figure 5 **Decomposition of changes in debt to GDP ratio**



Source: Bank of Papua New Guinea, 2005. *Quarterly Economic Bulletin*, November, Port Moresby; Papua New Guinea, 2004. *2005 Budget Documents*, November, Government of Papua New Guinea, Port Moresby.

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for this shift is twofold: to guard against the vagaries of exchange rate movements and to address risks in the Government's balance sheet. Over the medium term with the projected decline in mining and petroleum sectors and the associated fall in foreign currency budget receipts, there is risk of a mismatch between foreign currency liabilities and foreign currency assets.

The currency composition of external public debt is also being reconfigured. Currently, 36.4 per cent of foreign debt is denominated in Japanese yen, however, most trade is conducted in US and Australian dollars, while the Euro-zone accounts for nearly 20 per cent of PNG exports. Thus the debt strategy seeks to move the currency composition into line with international reserve inflows. The share of yen-denominated external debt will be reduced to between 10 and 15 per cent while the share of Australian and Euro dollar-denominated debt will grow to between 10 and 20 per cent. The share of US dollar loans will remain between 50 and 55 per cent.

The second front aims at extending the maturity of domestic debt to reduce risks associated with having to roll over and refinance short-term debt frequently. With the greatest proportion of domestic debt held as 28-day Treasury Bills the average maturity of domestic debt has until recently been less than six months. This maturity structure created high rollover and interest rate risk, increasing the risk premium, and forced yields on Treasury Bills to rates over 20 per cent in 2003.

The successful commencement of the Inscribed Stock issuance program and the switching program has extended the average time to maturity of domestic debt. For instance, the Government reported that the second debt switch issue in March this year lengthened the maturity of K100 million of debt from about 3 months to 3.2 years.

The Government has also moved to settle other outstanding liabilities such as arrears,

court judgments, and debts to the POSF and BPNG. These liabilities are additional to the public debt figures found in the Budget documents. During 2004, arrears of K36.5 million were cleared. POSF liabilities, some outstanding since 1997, were cleared completely in 2004 with cash payments of K132.5 million and K63.17 million in Inscribed Stock. Similarly, the Government cleared K4.59 million of outstanding pension liabilities with the Defence Force Retirement Benefit Fund.

Building on achievements

In the last three years, the Government has made good progress on the public finance front. A vital fiscal consolidation has been achieved, and a potential descent into debt unsustainability has been averted. The aggregate impact of public finances on the climate for growth and investment is being turned around, and benefits are being realised in the first signs of more broad-based growth.

The Government has stressed its continuing commitment to public expenditure management reform, with a clear focus on re-establishing control over spending. This has involved considerable effort to exert central budgetary control over the public sector payroll, as well as restoring the integrity of budget institutions and systems. Clearly, continued effort is needed in these areas: the problems being addressed are pervasive. But in addition to continued efforts to control waste and unplanned spending, the Government will also need to focus on strengthening the relationship between sectoral policies, resource allocation and delivery mechanisms.

As the Government makes progress in reestablishing budgetary control over spending, it must accelerate its efforts to establish stronger strategic and policy control over the budget. This is a critical

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ingredient to reversing the decline in the delivery of core public services that has underlain the country's poor development record. It is needed to ensure that resources are allocated to the activities and categories of expenditure that lie at the core of government functions.

This is a challenge that requires action across many fronts: but there are two areas that are now receiving considerable attention. One concerns enlisting provincial expenditures more effectively in the task of meeting nationally established goals. And the other is about strengthening mechanisms for linking national development strategies to budget decision-making and ensuring that spending leads to improved outcomes.

Enlisting provincial expenditure to national goals

The need to improve the contribution that provincial expenditures make to national development goals was highlighted in the work of the Public Expenditure Review and Rationalisation (PERR) exercise. The PERR, a collaborative effort between the Government and a multi-donor team led by the World Bank, examined a range of issue in public finance management. Among other things, the PERR pulled together some of the recent diagnostic work on spending in the health and education sectors in an examination of spending priorities and issues.

For both sectors, the PERR concluded that improving the impact of public expenditures depended heavily on addressing two issues that, as a legacy of the arrangements for intergovernmental relations and responsibilities established by the Organic Law on Provincial and Local-level Governments (OLPLLG), have been largely beyond national control, namely

- the allocation and cost of personnel, and
- the prioritisation of provincial spending.

In the education sector, the PERR observed that spending has for some time been

on a growth path influenced by the education reform agenda introduced with the National Education Plan. The goal of universal primary education has been actively pursued, and there have been major improvements in access, as enrolments in elementary and primary education have expanded rapidly. However, the rapid growth in the number of schools and students has stretched the system's capacity and resources, with negative consequences for learning outcomes.

As the PERR pointed out, nearly all of the increments in education spending in recent years have been absorbed by the growth in teachers' salaries and allowances as the teaching payroll has expanded. This has squeezed out expenditure on complementary goods and services, with detrimental effects on quality. At the heart of the problem is the disjuncture between policy formulation, financing and managerial control resulting from the allocation of responsibilities and functions across the national government, provinces and districts. This disjuncture created a situation in which the processes of establishing new schools, and creating new positions, was not required to take account of budgetary implications. Effectively, no agency in the approval process has been responsible for—or felt the direct consequences of—increases in the teacher salary bill.

A similar class of problems has been bedeviling the health sector. The serious condition of Papua New Guinea's health system has been highlighted on a number of occasions, along with the limited improvement that has occurred in health outcome indicators for the country. Many factors have played a part in the poor performance of the system, but the limited influence that nationally set priorities have on expenditure decisions made at the provincial level has been very important. National agencies are directly responsible for only limited parts of the health system (mainly hospitals and procurement of pharmaceuticals). Their

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influence over other elements of the system, most importantly rural health, is limited to policy setting and shaping donor support. Provinces and local-level governments are in charge of key elements of the system and its funding on the front line.

A more general problem that pervades the system of intergovernmental financing incorporated in the OLPLLG is that it places a very strong emphasis on infrastructure spending. It therefore tends to distort incentives regarding funding of recurrent costs to maintain existing services, or to ensure that adequate account is taken of the recurrent cost implications of new infrastructure.

Over the last two years, the Government has taken some steps to come to grips with the problems created by the absence of any formal mechanisms to ensure that nationally agreed priorities are reflected in the resource allocation decisions taken at the provincial level. While the National Economic and Fiscal Commission (NEFC) continues to work on proposals for a comprehensive overhaul of intergovernmental financing (Box 1), the

Government has introduced some interim mechanisms to influence resource use by provinces. One of these has been the adoption of function grants to fund spending directly on core priorities identified in the MTDS, primarily basic education, primary health, and transport infrastructure maintenance.

These grants are specific-purpose grants that can only be spent on the particular purpose for which they are given. In 2004 there were grants for primary health, basic education and rural transport infrastructure maintenance. The grants cannot be spent on salaries or capital, except for maintenance, under special circumstances. At least half of each function grant has to be allocated by the Provincial Government to be spent in the districts.

These interim measures have gone some way in addressing the problem. But a more comprehensive recasting of roles, responsibilities and financing—as being developed by the NEFC—is essential to put the delivery of key social services on a sustained footing.

Box 1

The Review of Intergovernmental Financing Arrangements

The National Economic and Fiscal Commission (NEFC) has been carrying out its Review of Intergovernmental Financing Arrangements since 2001, with the aim of developing proposals for a new system to replace that introduced with the OLPLLG. The Commission's work has identified the current financing arrangements as a significant contributor to poor service delivery in Papua New Guinea, as well as pointing to more obvious deficiencies such as lack of affordability, inequitable distribution of resources, inadequate recognition of provinces' internal revenue generation capabilities and differential capacities. The Commission is currently engaged in a collaborative process with the provincial and national governments to map the assignment of functional responsibilities. NEFC has already embarked on a costings exercise for the delivery of basic services in each province. By late 2005 it is hoped that the principles and a preliminary design of the new system will be presented to the national and provincial governments.

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Improving the linkage between development strategies and the budget process

While the system of intergovernmental financing and the associated allocation of responsibilities is an important source of disjuncture between policy objectives and budgetary resource allocation, it is not the only one. At the national level, the frequency of fiscal crises has required the budget process to concentrate on the task of keeping spending in check. A consequence has been that budget preparation became increasingly less effective as a forum for aligning budget

allocations with overall national priorities, or for helping spending agencies to calibrate programs and policy objectives to resource availability. The PERR indicated that the resolution to this problem lies in moving to a medium-term expenditure or budget framework approach to expenditure management (Box 2) that can link budget allocations to national priorities and introduce a strategic basis to budget preparation so that expenditures are aimed at achieving agreed objectives. Planning expenditures in a medium term context will permit increased commitment to predictability of both policy

Box 2

A medium-term expenditure framework

Government budgets are prepared according to an annual cycle, but to be formulated well and to contribute to high-quality and sustainable services they must take into account events outside the annual cycle, particularly macroeconomic realities, expected revenues, and the longer-term needs of programs and of government's spending policies. This is why annual budgeting cannot be performed properly in isolation but has to be linked to planning, in the context of a multiyear framework (World Bank 2003).

A medium-term expenditure framework (MTEF) consists of a top-down estimate of aggregate resources available for public expenditure consistent with macroeconomic stability; bottom-up estimates of the cost of carrying out policies, both existing and new; and a framework that reconciles these costs with aggregate resources. It is called 'medium-term' because it provides data on a prospective basis, for the budget year and for the following years.

An MTEF is a rolling process repeated every year that aims at reducing the imbalance between what is affordable and what is demanded by line agencies. The MTEF does this by bringing together policymaking, planning, and budgeting early in the budgeting cycle, with adjustments taking place through policy changes. A well-implemented MTEF should

- link the Government's priorities with a budget within a sustainable spending envelope
- highlight the tradeoffs across the competing objectives of the government
- link budgets with the policy choices made
- improve outcomes by increasing transparency, accountability, and the predictability of funding.

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and funding so that spending agencies can plan ahead and programs can be sustained. It can also provide for better integration of recurrent and development budgets.

The Government indicated in the 2004 Budget that it intends to develop a medium-term budget framework by refining the MTDS to adequately reflect the trade-offs associated with a declining resource envelope and the Government's priorities and policies. However, it has to be recognised that moving to a full medium-term framework will take time, although some of the key building blocks are being put in place.

Notes

¹ The latest information on mineral exports, presented in the Bank of Papua New Guinea's December 2004 *Quarterly Economic Bulletin*, indicates that export volumes of gold and copper fell by 8 per cent and 23 per cent respectively over 2003 levels, so estimates of mining GDP may be revised downwards.

² See the 17 March 2005 Media statement by Hon. Bart Philemon. 'Treasurer welcomes anticipated building boom', http://www.treasury.gov.pg/FILES/media_release/Building_Boom.pdf (accessed 1 May 2005).

$$^3 \quad EMP_t = \frac{\Delta s_t / s_t}{\sigma_{(\Delta s_t / s_t)}} - \frac{\Delta R_t}{\sigma_{\Delta R}} + \frac{\Delta i_t}{\sigma_{\Delta i_t}},$$

EMP is the index of exchange market pressure, s is the kina per US dollar exchange rate, r is the non-gold international reserves held by the bank of Papua New Guinea and i is the 182-day Treasury Bill rate. Each component is weighted by its standard deviation to preclude domination of the index by any one component.

⁴ Here volatility is measured by the standard deviation of the percentage change in end-month exchange rates. Standard deviations for 2003 and 2004 were 2.68 and 0.42 respectively.

⁵ $MCI_t = (r_t - r_b) + \theta(q_t - q_b)$, is a weighted average of the percentage change in the real exchange rate ($q_t - q_b$) and the percentage point change in the real interest rate, r . The relative weight q , has a value of 1.4 and is derived from the macroeconomic model estimated by Kannapiran (2003). A base period of March 2002 has been used.

⁶ $Fiscal\ impulse_t = -(\Delta B_t) - g_0 \Delta Y_t^p + t_0 \Delta Y_t$, where B represents the budget balance, Y^p is potential output (here computed using the Hodrick-Prescott filter), and Y is nominal GDP, T =public revenue (grants not included), G =expenditure less grant-funded outlays, g_0 ($= G_0/Y_0$) is the base year expenditure ratio, t_0 ($= T_0/Y_0$) the base-year revenue ratio Δ is the change operator. A rolling base year has been adopted so the previous year is the base for current year. Elasticities, with respect to nominal and potential output, of 1 have been assumed for public revenue and of public expenditure.

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