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Natural Disasters and the Island Economies: An Examination of the Economic Cost of Natural Disasters in Fiji

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Abstract

Natural disasters are common to Pacific Island countries and have caused a major drain in government's annual budget. Apart from the short term and direct effect of loss in capital stock and GDP, the long-term effect on development of the economy arise out of the loss of capital stock and the deferred capital project allocations for use in relief and rehabilitation work. The economy is also effected in the longer run through increased borrowing, debt and debt charges. This constitutes a large portion of government expenditure. The high level if indebtedness and budget deficit was also a reason for government to change its economic policy direction to one of a export led growth and development. In summary, the impact of natural disasters has had a serious effect on the economy both in the short and long run. The longer run impact is now compounded by the fact that economic policies of the island economies has changed but has yet to deliver the desired goals. This paper examines these cost scenarios and suggests possible policy options that the government could take to minimise the damage on the economy from the natural disasters.

Introduction

Natural disasters are common to the Pacific Island countries and have caused major economic and social problems to island population. The island nations have a very narrow resources base and the economies are dependent on few commodities as their major income source. This makes them more vulnerable to natural disasters, and in some cases, can lead to the total collapse of the economies. Since most of the island nations are heavily reliant on the agricultural sector, natural disasters like cyclones, drought and flooding affect the agricultural sector the most.

A natural disaster affects the island nations in two ways. First it destroys a significant chunk of the capital stock, which is key to the long-term sustainable development. The reduction in capital stock has a long run (inter-temporal) impact on the economy. Secondly, in the short run, the overall output, Gross Domestic Product (GDP) of the country falls. While specific sectors of the economy will have a direct impact, the whole economy (economy wide), through inter-sectoral linkages, will also be affected. Therefore, any decline in GDP will have serious developmental implications on the fragile economic bases of the island nations. Issues such as food security, income, employment and poverty will all be at the limelight.

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This paper examines the economic social cost of natural disasters on Fiji. The first section of the paper provides overview of the natural disasters that Fiji has faced over the last three decades and the loss in output and capital stock occurred during these period. The second section of the paper uses a simple GDP model of the economy to estimate the impact of loss in capital stock on the economy. The third section provides summary and policy implications.

The Economy and Natural Disasters in Fiji

Fiji's economy is heavily reliant on the agricultural sector for the growth and development of the country. Approximately 19% of the GDP (Table 1) are derived from this sector and a large portion of the population, either directly or indirectly earn their living from this sector. Through inter-sectoral linkages, the agricultural sector is strongly linked to the non-agricultural sector.

Table 1. Real GDP (F$m) by activity, 1995-1998.

Activity	1995	1996	1997	1998
Agriculture, Forestry and Fisheries	362.8	369.5	321.3	305.0
Mining and Quarrying	46.7	61.2	62.7	50.2
Manufacturing	267.7	276.9	274.7	264.3
Electricity and Water	71.5	77.0	79.0	81.4
Building and Construction	81.4	76.9	82.6	94.6
Wholesale and Retail, Trade, Restaurant and Hotels	160.3	163.9	174.2	184.8
Transport and Communications	222.7	236.3	247.2	259.7
Finance, Insurance, Real Estate and Business Services	256.9	255.3	237.2	245.1
Community Social and Personal Services	355.4	356.6	364.6	363.5
Others	14.7	15.2	15.0	14.6
Less Imputed Service Charges	−139.2	−137.2	−121.4	−126.8
Total	1838.8	1897.1	1864.9	1840.6

Date source: Reserve Bank Quarterly, Reserve Bank of Fiji, 1980-98.

Economic Cost: Macro Level

Loss in output and capital stock

Fiji faces three major types of natural disasters, cyclones/hurricanes, flooding and drought. The most common is cyclones and is often followed by flooding. A summary of the natural disasters since 1970 is provided in appendix 1. Since 1961, Fiji faced 35 natural disasters over a period of 39 years. These disasters have caused the nation a lot in monetary terms. Data on the monetary value of the damage are available for only recent disasters and these are presented in Table 2.

Table 2. Cost of recent natural disasters in Fiji (F$m).

	Loss of Capital Stock	Agricul-ture	Others	Total	% of Gov't Exp	% of GDP
Flash Flood 1999	5.3	1.7	1.1	8.1	0.8	0.2
Drought 1997/98	0	125.0	19.8	144.8	11.7	5.3
Gale 'June' 1997	NA	NA	NA	1.0	0.09	0.03
Hurricane 'Kina' 1992/93	NA	64.0	NA	154.0	18.8	7.1
Cyclone 'Gavin'1985	19.5	13.9	0.9	34.3	8.3	2.9
Hurricane 'Eric'1985	NA	NA	NA	40.0	9.7	3.4
Hurricane 'Oscar'1983	NA	NA	NA	80.0	21.8	7.8

Source: DISMAC, Ministry of Regional Development and Multi-Ethnic Affairs, Government Buildings, Suva, Fiji.

The cost to the nation are in millions of dollars, rising up to F$154m (in the case of hurricane in 1993), with one disaster alone. The loss resulting from the disaster in 1993 amounted to 7.1% of the country's GDP. Natural disasters can be very damaging if it hits the engine of growth of any economy. The natural disaster in 1997/98 did nothing less than this. The effect of it, coupled with other external shocks, led to a recession in the economy. The negative GDP growth in Fiji in 1997 and 1998 of −1.7 and −1.3 respectively (Table 3) is a clear reflection of the effect of the drought on the economy via the agriculture sector. This disaster was equivalent to 11.7% of total government expenditure in 1998.

The unit cost of loss in capital on GDP can also be modelled quantitatively. The relationship between capital, labour, natural disaster and GDP are modelled by the following linear equation:

$$GDP_t = f(L_t, K_t, D1_t, D2_t) \quad (1)$$

Where GDPt = Gross Domestic Product of Fiji in year t (in millions of F$);

L_t = Total Paid Employment in year t (in millions);

K_t = Gross Capital Formation in year t (in millions of F$);

$D1_t$ = Natural Disaster Dummy Variable (1=Natural Disaster, 0=Otherwise); and,

$D2_t$ = Coup Dummy Variable (1= Coup year, 0=Otherwise).

A priori, the signs of the variables L t and Kt are expected to be positive. This implies that an increase in labour force and capital stock will have a positive effect on economic growth. Both the dummy variables are expected to have negative signs. For the case of D1t, an occurrence of a natural disaster will reduce GDP. Similarly, an occurrence of any political instability in the country will also affect economic growth negatively.

The estimated linear model is as follows:

$$GDP_t = 198.9 + 12823L_t + 0.782K_t - 16.41D1_t - 74.82D2_t \quad (2)$$

The signs of all the variables conform to a priori expectations. The model shows a good fit (R2 of 91%) and the variables Lt, Kt and D1t are significant at 5% level. The estimated model (2) indicates that on an average, a natural disaster reduces GDP by F$16.4m, *cetirus peribus*. This is equivalent to 1.2% of mean GDP (mean of the GDP variable). The loss in capital due to natural disasters can also be simulated and its impact on GDP derived. A loss of capital stock by F$50m would reduce GDP by 4.1% at mean

levels of labour variable, no coup scenario and a natural disaster scenario. A preceding analysis reveals the gravity of natural disasters on the economy.

Government Expenditure, Budget Deficit and Debt

Apart from the direct impact on GDP and capital stock, there are also other economy wide impact of natural disaster. On of the impact is on government budget and debt. Following a natural disaster, additional funding is also required to finance relief and rehabilitation work. Funding for this could come from three sources, External Aid, Government funding and local NGOs. Government finances the relief and rehabilitation work from two sources, firstly, by additional borrowing and secondly from capital expenditure allocated for other projects by all the Ministries. This means that due to the natural disaster, important capital projects are now put on hold so that allocated funds can now be used to repair and build the lost capital. In addition to the above, if External Aid, redeployment of funds and funds from NGOs are not sufficient, then government resorts to additional borrowing to finance the relief and rehabilitation work. The additional borrowing, while increasing budget deficit, contributes to increasing debt and debt charges (Table 3). Increasing debt charges has a long term budgetary implications.

Table 3. Selected economic indicators of Fiji economy, 1985-1998.

Year	Real GDP Growth (%)	Trade Balance (F$m)	Public External Debt (F$m)	Total Govt. Debt (F$m)	Public Debt Charges (F$m)	FR Position (months of Imports cover)
1985	−5.1	−236.5	318.1	NA	64.8	3.5
1986	8.1	−181.1	332.6	NA	74.7	4.8
1987	−6.4	−58.5	437.8	NA	89.9	4.9
1988	2.1	−120.1	442.6	NA	159.9	5.9
1989	12.9	−165.9	416.8	NA	127.2	4.4
1990	3.5	−331.9	392.8	NA	121.9	4.1
1991	−2.7	−269.8	354.5	805.6	136.3	5.0
1992	6.1	−276.1	324.4	843.5	123.5	6.2
1993	2.6	−425.5	279.5	923.8	153.0	4.3
1994	5.1	−326.7	235.1	981.8	144.1	3.8
1995	2.5	−330.0	229.4	1,001.8	169.5	4.8
1996	3.2	−267.4	217.8	1,133.4	151.3	5.1
1997	−1.7	−421.4	225.6	1,356.2	180.2	4.8
1998	−1.3	NA	277.3	1,306.1	NA	NA

Note: NA=Data not available.
Date source: Reserve Bank Quarterly, Reserve Bank of Fiji, 1980-98.

Given the large number of natural disasters that the country has faced, its impact on debt build-up cannot b doubted. The current debt level is quite high, approximately 45% of GDP and debt charges resulting from it, around F$150m/year, are a serious blow to the ever constraint budget.

External Aid and Inflation

External Aid is received by a country if its declares a state of emergency in the wake of a natural disaster. While the positive effects of it are pretty clear, the negative effects of it are on inflation levels. Sudden influx of aid money increases the money supply and thus aggregate demand. Therefore, the Reserve Bank needs to be more vigilant with respect to inflation control via monetary policy. Natural disasters also lead to inflation when there is a sudden shortage of agricultural products due to the natural disasters. Since Pacific Island countries are quite small in area, the natural disasters generally affects the whole country. Therefore, this could lead to sudden shortage of agricultural and other products that has been affected by the disaster. Therefore, a combination of both a cost push and demand pull inflation can have a disastrous impact on the poor of the society.

Trade Balance and Foreign Reserves

Natural disasters also add on to the import bill and blow up the trade balance (Table 3). This places the countries foreign reserve under a dangerous position. A healthy foreign reserve position is one, which is able to provide approximately 7 months of import cover. Results in table 3 shows that Fiji's foreign reserves have been around 5 months on an average.

Economic and Social Cost: Micro Level

Rural income and Food Security

Natural disasters have a serious impact on the agriculture sector and thus on the agrarian population of the island nations. Fiji is no exception in this case. Most of the population live in the rural area (54%) and are actively engaged in the agricultural activities. Subsistence farming is also quite widespread and approximately 1/3 of the agricultural GDP is derived from subsistence farming. Any external shock such as a natural disaster will have serious repercussion on these agrarian communitys' livelihood. The primary impact would be on food security. Most of these farmers do not have any savings to rely on in scenarios of loss of their source of income. They are also not able to meet the criteria[2] to apply for the limited amount of social welfare funds which are dispersed to welfare recipients (F$15-80/month). During the drought, the number of applications for welfare grant increased significantly (Table 4).

Loan default and Indebtedness

The second problem arising out of natural disasters are default on loan payments and increased indebtedness. A large number of farmers are highly indebted. If loans provided by commercial banks and Fiji Development Bank are examined, then on an average,

2 Criteria for family assistance: 1) People of 60 years and over; 2) Dependents of people who are in jail; 3) Breadwinners who are chronically ill; 4) Breadwinners who are severely disabled (mentally or physically); 5) Widows with dependents; 6) Women who have been deserted by their husbands; 7) All the above must have little or no means of financial support.

outstanding loans amount to F$150-200m/year (Table 5).

Farmers have small loan accounts with local shops and repayments are made when crop or livestock are sold. Therefore, these transactions from local shops are placed in jeopardy when the income source is destroyed by the natural disaster.

Loss of Sole Income Earner

Natural disasters also create hardship at family level if the sole income earner is lost during the disaster. The disasters in Fiji since 1961 have claimed 237 lives (Table 6). In a traditional society, generally the head of the household is the sole breadwinner in the family. Therefore, loss of the breadwinner in the family can be serious blow to the family and lead to poverty.

Drop-out from Formal Education

Another serious long-term implication on both the family and the nation is the inability of parents to send their children to school due to lack of food and bus fare. UNDP (1998) report states that of the total 80,280 primary and secondary school students in the western division, 11,126 required assistance with food while 6,753 required assistance with bus fare (Table 7).

Table 4.Welfare applicants and new applications, 1996-98.

Division	Year		
	1996	1997	1998 (Sept)
Western			
Total no. of Recipients	3983	4088	4105
Total no. of Recipients	1177	1019	806
Northern			
Total no. of Recipients	2212	2340	2521
Total no. of Recipients	724	627	709

Data source: UNDAC Mission Report: Fiji Drought, UNDP, 1998.

Table 5. Agriculture sector outstanding Loans, 1991-1998.

Year	Total Loans Outstanding (F$m)
1991	205.1
1992	208.9
1993	209.7
1994	214.6
1995	186.1
1996	178.2
1997	137.2
1998	140.4

Date source: Reserve Bank Quarterly, Reserve Bank of Fiji, 1991-98.

Table 6. No of deaths arising from natural disasters

Year	No of Deaths
1991-1999	31
1981-1990	49
1971-1980	143
1961-1970	14

Source: DISMAC, Ministry of Regional Development and Multi-Ethnic Affairs, Government Buildings, Suva, Fiji.

Table 7. No of secondary and primary school children affected by Drought.

Need Type	No of Student	No Assisted
Food	11,126	3781
Bus fare	6,753	996

Source: UNDAC Mission Report: Fiji Drought, UNDP, 1998.

Absenteeism rate at schools ranged from 5-15% in these schools. The drop-out of children from obtaining formal education will have serious repercussion on the economy over the longer run period.

Summary and Policy Implications

Natural disasters have become a fact of life of the island communities. There is no way one can avoid the aftermath of it. What can be done is to, first, minimise the damage resulting from it and second to provide relief and rehabilitate the damage immediately after the disaster. The damage could be minimised in a number of ways. Building structures need to be constructed as per the specification of the engineers. Those who could afford to hire engineers during the construction period and also could afford to make the necessary changes as per the standards can only do this. Most of the agrarian population in Fiji and other island nations are not able to afford an engineer during the construction period and thus their houses are not hurricane proof. An alternative would be to insure the houses and property against the natural disasters. However, to do so, the standards are to be met and again the agrarian poor are left out.

The agriculture sector is in worst scenario at the moment since the insurance companies in Fiji do not provide crop or livestock insurance cover. The primary reason may be the high incidence of natural disasters encountered in the region. Therefore, not much could be done to minimise the direct damage done to the crop sector from cyclones. However, damage from flooding could be reduced if proper drainage is done in flood prone areas and technological developments with regard to minimising flood damage is adopted. Furthermore, rivers, which overflow during the rainy season, should be dredged on a periodic basis.

Post disaster period is also important to prevent any further casualties and minimise starvation, disease outbreak and any further impact on the economy. Since it is now fairly clear that the probability of natural disaster occurring in any one year is fairly high, government should set up contingency fund to cope up with immediate relief and rehabilitation work. In the 2000 budget, the government has plans to establish a permanent department of disaster management. In addition to this, a amount of F$2m has been set aside to provide immediate relief operations in the event of any natural disaster. This is certainly a step in the right direction. However, given the level of damage natural disasters cause, this amount seems to be insufficient, particularly when only the funding is for relief work. An additional sum, around F$20m, should be set aside for rehabilitation work.

Disaster management office should be further strengthened with training and resources to enable them to co-ordinate relief and rehabilitation work promptly and efficiently. Fiji has a fairly large number of NGO communities and their effectiveness during the past

disasters was highly commended. NGOs such as Red Cross, Save the Children Fund, Church groups and other social/charitable organisations carried out a very focussed work during the drought in Fiji in 1998 (UNDP, 1998). However, they seems not to agree on what their respective roles should be (NARSEY, 1998). While the DISMAC has a window of opportunity now, they should take this opportunity to organise and establish link with all NGOs at all the districts and define their roles clearly. This will allow them to reach the needy at the earliest and in a more efficient and effective manner.

The provision of food rations, water other emergency supplies are what is needed immediately after any disaster such as flood or hurricane. However, the relief effort should not stop there as this is a short-term solution only. At the national level, food aid must avoid certain adverse effects and generate certain favourable effects (EZEKIEL, 1988). The adverse effects that must be avoided are: a) disincentive effects on food production, and (b) dependency effects on food policy. The favourable effects that must be generated are: (a) increased food security, (b) greater equity, and (c) faster development. As KORTEN (1987) puts it, food and other relief materials will only lead to the temporary alleviation of the symptoms of underdevelopment. Therefore, for example, for an agricultural community, the relief supplies should include seeds, fertilisers some basic farm equipment's. This would enhance the long-term development of the community.

Since agriculture will continue to play an important role in enhancing the livelihood of the rural population and also contribute to the growth and development of the country, government should seriously look into provision of insurance cover for the agricultural sector. Effects from natural disasters such as drought can be minimised to a great extent if waters resources in the country can be better managed. Water shortage in Fiji is not a problem. Rather, it is more of extraction, management and distribution of this resource a problem. Fiji needs to make significant investment on irrigation to minimise damage to the agricultural sector in Fiji during the drought. The country can gain a lot from borrowing technology developed in other country and minimising damage from natural disasters is one area where it could be of great value.

Government could also examine the possibility of an insurance scheme which could cover damages arising out of an natural disaster. Due to high indebtedness and poverty level in the agrarian communities, government intervention is necessary to get this initiative of the ground. In the longer run, it would reduce much larger burden of the shoulders of the government. Insurance policies could either be taken up by individuals or in groups such as co-operatives.

References

EZEKIEL, H. 1988. An approach to a food aid strategy. World Development, 16, 1377-1387.

KORTEN, D.C. 1987. Third generation NGO strategies: A key to people-centred development. World Development, 15, 145-159.

NARSEY, W. 1998. State, NGOs must agree on national disaster roles. 7pp, Fiji Times, Thursday October 15.

Reserve Bank of Fiji 1977-1999. Quarterly review. 76pp, Reserve Bank of Fiji.
UNDP 1998. UNDP mission report Fiji drought, 48pp, UNDP.

Appendix 1. Profile of natural disasters in Fiji, 1970-1999.

No.	Type and Period	Areas Affected	Factors	Degree of Disaster
1	Hurricane 'Bebe" 23-29/10/72	Whole of Fiji	Gale to hurricane force winds. Flooding.	Severe flooding in Viti Levu; extensive damage to infrastructure and root crops
2	Hurricane 'Lottie' 9-10/12/1973	Southern parts of Fiji	Hurricane force winds	2 vessels sunk; 70 deaths
3	Hurricane 'Val' 31 Jan-2 Feb, 1975	Central to Southern Lau, Southern parts of Viti Levu	Hurricane force winds	Extensive damage in Lau group and Kadavu; 1 death.
4	Hurricane 'Betty' 5-6 April, 1975	Southwestern Viti Levu, Kadavu, Southern Lau	Near hurricane force winds. Tornado	Extensive damage in Kadavu; a small tornado caused some damage in Yako village close to Nadi
5	Hurricane 'Bob' 4-5 Jan, 1978	Western Viti Levu, Yasawas, Mamanuca Group	Storm force winds, possibly tornado	A possible tornado demolished several houses in Sabeto near Nadi; 1 death.
6	Storm 'Fay' 29-30 December, 1978	Rotuma, Eastern Vanua Levu, Tavenuni, Lau Group	Storm force winds. Flooding. Storm surge.	Major flooding in Vanua Levu and Taveuni; coastal damage in Lau groups
7	Hurricane 'Meli' 26-28 March, 1979	Southern islands of Fiji, Southern and Southeastern Viti Levu	Hurricane force winds. Storm surge. Landslides Flooding.	Infrastructure damage and flood damage in Viti Levu; 11 vessels either lost, damaged, sunk or grounded; 52 deaths.
8	Storm 'Tia' 24th March, 1980	Vanua Levu, Northern and Central Lau	Storm force winds. Flooding Storm surge Landslides	Flooding in all coastal rivers of Viti Levu from Korolevu to Nausori; several fatal landslides; extensive damage to main highway; considerable loss of livestock, pasture and crops; 2 missing and 14 deaths.
9	Gale 'Wally' 3-5 Apr, 1980	Viti Levu, Yasawas, islands off Southern Viti Levu	Gale to force winds. Flooding. Landslides	Flooding in all coastal rivers of Viti Levu from Korolevu to Nausori; several fatal landslides; extensive damage to main highway; considerable loss of livestock, pasture and crops; 2 missing and 14 deaths

Appendix 1. (Continued.)

No.	Type and Period	Areas Affected	Factors	Degree of Disaster
10	Hurricane 'Arthur' 13-16 Jan, 1981	Western one third of Viti Levu, Yasawas, Mamanuca group, Kadavu	Hurricane or near hurricane force winds. Flooding	Considerable damage to infrastructure; disruption to communication in some places
11	Hurricane 'Oscar' 26 Feb-2 Mar, 1983	Western and Southwestern Viti Levu, Mamanuca group, Kadavu.	Storm to hurricane force winds. Torrential rain. Flooding. Storm surge	Severe flood damage in towns in Viti Levu; widespread damage to dwelling and infrastructure, livestock, crops, forestry and vegetation; disruptions to water supply and communication; considerable coastal erosion; 9 deaths.
12	Huricane 'Sarah' 25-28 March, 1983	Eastern parts of Vanua Levu, Lau group	Storm to gale force winds.	Widespread damage to crops, vegetation and building in Lau Group
13	Drought 1983	NA	NA	NA
14	Hurricane 'Eric' 14-19 Jan, 1985	Western Fiji, Viti Levu, Southern Lau, Yasawas and Mamanucas	Gale to hurricane force winds. Flooding	Partial or complete destruction of villages, buildings, Nadi Airport hanger and other infrastructure; disruptions of power supply, radio reception to the western Viti Levu, communications and water supply in some places; damage or destruction to forestry; crops and livestock losses due to flooding; 3 Government vessels either sunk or grounded; 25 deaths;
16	Storm 'Gavin' 3-8 March 1985	Western and Southwestern parts of Fiji	Gale to winds. Torrential rain Flooding Landslides	Severe widespread flooding in Viti Levu; damage to some power and communication lines, crops and vegetation; closure of several roads, bridges and both main airports due to flooding; 3 deaths; 7 missing.
17	Drought 1987	NA	NA	NA
18	Drought1992	NA	NA	NA
19	Hurricane 'Kina' 26 Dec-5 Jan, 1992/93	Whole of Fiji	Hurricane force winds. Flooding High tides and Landslides	Extensive flooding in major rivers; destruction to Ba and Sigatoka bridges led to major disruption to transportation Eastern and Western Divisions; landslides cut road access to inland; almost loss of crop in Sigatoka and Navua/Nausori areas; major loss of livestock; significant infrastructure damage; 23 deaths.
20	Drought1993	NA	NA	NA
21	Gale 'Oli' 15-18 Feb, 1993	Southwestern parts of Viti Levu	Gale force winds. Tortorential rain. Flooding.	Some damage to bridges at Ba, Nadroga and Sigatoka.

Appendix 1. (Continued.)

No.	Type and Period	Areas Affected	Factors	Degree of Disaster
23	Gale 'June' 3-5 May,1997	Yasawas, Mamanuca group, Northwestern Viti Levu, southern parts of Fiji	Gale force winds. Torrential rain	Damages to crops and infrastructure.
24	Drought 1997/98	Western Vitilevu and Vanua Levu	Zero rain	Extensive damage to crop and livestock. Shortage of water for household use.
25	Flash Flood Jan, 1999	Western Vitilevu	Flooding landslides	Extensive damage to shops, houses, infrastructure and agriculture.

Source: DISMAC, Ministry of Regional Development and Multi-Ethnic Affairs, Government Buildings, Suva, Fiji.
NA= Information not available.