



AUSTRALIAN
INTERNATIONAL
DEVELOPMENT
ASSISTANCE
BUREAU

DEPARTMENT OF FOREIGN AFFAIRS AND TRADE

**REPORT TO
THE GOVERNMENT OF TUVALU**

LOnGO FAI FENUA, MANAFA, FAKAI & FALE
(wise ways to sustain coral islands, land, settlements & houses)

LIFE & LIVING IN TUVALU

VOLUME 1 : FINDINGS

JULY 1993

PACIFIC REGIONAL TEAM

CENTRE FOR PACIFIC DEVELOPMENT AND TRAINING

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& to

**The Centre for Pacific Development & Training
Australian International Development Assistance Bureau**

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steps towards sustainable strategies
with particular reference to
housing, infrastructure & land use

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VOLUME 1: FINDINGS

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Executive Summary:

EVENTS WHICH LED TO THIS RESEARCH; THE TERMS OF REFERENCE; PROCEDURES; & FINDINGS.

Housing and Nation-building since 1973

1. It is now 20 years since Cyclone Bebe (21 October, 1972) made homeless all the then 800 residents of Funafuti Atoll, by destroying **all 125** houses in the village, **all** government, church and community buildings, and **half** the trees, on Fongafale Islet, the site of the administrative headquarters of the Ellice Islands.
2. This 400 acre Islet, with its 12 acre neighbour, Amatuku Islet, is now the urban capital of the sovereign Government of Tuvalu; it is the national centre of air and ocean transport, of national institutions such as the Civil Service and the Church of Tuvalu, and of the cash sector of the largely subsistence economy of the 9 Island Nation. National population, at the 1991 Census, was 9,043 people.
3. Over the 20 years since Bebe, more than **474** houses (including 17 directly funded by Australia) have been built on Fongafale and Amatuku Islets of Funafuti Atoll: these Islets now have a population of about **3,850**, about **43%** of national population, and continuing to increase. Since 1973, a total of about **248** additional houses have been built on the 8 other, "Outer" Islands: these include at least 1 directly funded by Australia, and at least 2 by New Zealand.
4. The U.K. was Tuvalu's major donor in all sectors, including the urban development and housing sectors, at least until 1979, by which time there were **301** new houses on Funafuti Atoll.

Australia becomes Tuvalu's development partner in housing.

5. Between 1980 and 1986, 9 Australian designed and donated houses were built on Amatuku Islet for the staff of the Australian-funded Tuvalu Maritime School.
6. In 1984/5, the Tuvalu Government requested Australia to fund a 5 year programme of **55** additional houses for Civil Servants. The Government could fit **23** more houses on remaining Government-leased land on Fongafale Islet, so **23** were requested there; and the other **32** were to be distributed among the 8 Outer Islands.

The 1984/5 PWD prototype of a Civil Servant's house.

7. The Tuvalu Government requested the testing of a prototype design by its Public Works Division for a Civil Servant's house. This was a square, 53 sq m, slab on ground, **27°** pitch pyramid roof with a raised lantern, on a reinforced concrete framed, cyclone resistant, 2 bedroom house with a central bathroom, kitchen and cyclone shelter passage way.
8. During 1984/5, Australia funded construction, by the Tuvalu Public Works Division, of 2 of these prototypes: 1 on Fongafale Islet; and 1 on Nukulaelae

Atoll, at the Primary School. The Tuvalu PWD, the Government, and the occupants, seem to have concurred that this house-design was far **too costly, too complicated, too concrete, too square and too uncomfortable to live in**: wind-driven horizontal rain blew in through the lantern; the design proved unpopular. Different designs and methods had to be sought.

The 1985 Samson Report

9. AIDAB, the Australian International Development Assistance Bureau, commissioned an independent tropical architecture specialist, the architect Tony Samson of Fiji, to design alternatives. Samson submitted a full report dated September 1985 on tropical design principles, detailed house designs, construction details and costings. These were for a well ventilated, lineal 12m x 4.8m, or 58 sq m, house with a raised timber floor; and a 1½ storey, cyclone resistant **45°** pitch gable roof with a waterproof, **continuous convection ridge vent**. The bathroom and/or the kitchen could be in a separate, close-by structure, linked by a pergola; the design was flexible in floor area; it could be in a range of sizes or "grades". It could be built in Tuvalu, using fully imported, pre-cut, materials. **It is a simple, cool, intelligent design, but still partly "European" in concept, and in fully imported materials.**

The 1988/9 J.S. Hill houses

10. However, it appears from the files that, perhaps during a visit south, Tuvalu decision makers became aware of European/American/Australian style, small 3 bedroom, double-fronted square houses, fully factory manufactured on a production line, by the large Fijian building and civil engineering contractor, J.S. Hill & Associates Ltd, through its subsidiary, Lami Housing & Joinery. Australia was requested to finance a trial project and AIDAB engaged the Sydney architects, Gazzard, Sheldon & Associates, to assist the Tuvalu Government to specify the details it wanted in a J.S. Hill style house. The contract, finally won by J.S. Hill, was administered by AIDAB, on the basis of a house design selected and approved by the Tuvalu Government.

11. **Ten** of the J.S. Hill houses were fully imported and erected in Tuvalu, apparently by J.S. Hill people from Fiji, during 1988 and 1989. Eight of these were funded by Australia, and two by New Zealand. Six were erected on Fongafale Islet, and 1 each on the Outer Islands of Nanumea, Niutao, Nui and Nukufetau. All, presumably, have been occupied by Civil Servants since 1989. In 1989, Australia also funded the import and erection on Fongafale Islet, of **3** prefabricated J.S. Hill buildings for temporary use as primary school classrooms, and later conversion to **6** houses for Civil Servants. By 1992, these were no longer being used as classrooms.

12. J.S. Hill claimed large sums as "extra costs" for the houses, additional to the original contract sum. After much difficulty, and additional administrative costs, AIDAB was obliged to approve the extra costs as justified, and to pay them. The **J.S. Hill houses** are believed to have cost between **5 and 10 times** the cost of a normal, contemporary, middle class, privately-built, Tuvaluan house.

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13. The J.S. Hill houses are about 60 sq m in overall floor area, including a small porch, which gives them an old-fashioned (1950's) Australian low cost "double fronted" look. They are close to a square in plan, with tightly sealed, low pitched roofs; with a few narrow vertical windows filled by glass louvres and timber storm shutters; internally they are partitioned into a number of private European style "rooms".

14. **The design makes adequate cross ventilation, and convection cooling, impossible in Tuvalu's climate.** The design may be bearable in mountainous Fiji, which is much further away from the Equator. There are 3 exceptionally small, private, box-like bedrooms, climatically and culturally inappropriate in Tuvalu. The **sleeping** patterns of occupants vary with the location of the house, the season of the year, and the number of visiting relatives. Some locations are more exposed to easterly breezes than others; some are more exposed to wind-driven rain. Occupants interviewed in 1992 advised that the bedrooms are mostly used only for storage, or for short periods of marital privacy. Where electricity is available, the Government has supplied an **electric fan**. When this is working, it is mostly used continuously in the combined kitchen-dining-living space, where most people sleep: this is costly in electricity. People also say they, or their visiting relatives, often sleep in adjacent self-built, open, pavilions (traditional fales), or in the open, unwallled, community maneapa.

15. There is a small, poorly ventilated bathroom with a **shower** served by a header tank. Where electricity is available (only on Fongafale Islet) the header tank is filled by an **electric pump** (possibly an automatic one); elsewhere a hand pump is supplied. Occupants report all these pumps as liable to breakdown, and the electric pumps as costly to operate and maintain.

The 1990 Project Appraisal Mission Report and Recommendations

16. In 1990, AIDAB's Project Appraisal Mission (Messrs Dickson & Cholerton) observed, and were informed of, these types of problems with the J.S. Hill houses. The Mission reported that costs and administrative problems had been excessive, and had produced **"poor results"** for Tuvalu and for Australia. It is obvious that future developments in Tuvalu should **not** be implemented in this manner."

17. The Executive Summary of the 1990 Dickson-Cholerton Appraisal Mission Report noted **vagaries in population estimates** since the 1979 Census; the need to consider **privately** financed and built housing as well as **Government** financed and built housing; problems of **land tenure and acquisition** by Government; the strong **cultural** tradition and extended family lifestyle; the dominance of **Government employment** as a source of cash income; and the **British legacy** of civil service housing provision. The Executive Summary concluded:-

"The Mission identified **key issues** which need to be addressed in any review of the housing sector. These include:

"(a) The perceived **urbanisation of Funafuti**;

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- "(b) The assessment of housing demand including standards and **affordability for the public and private sectors** on Funafuti and the outer islands;
- "(c) The development of an **equitable** method of delivery of housing including both **private and public capital**;
- "(d) The need for a **comprehensive land planning and management policy**.

"The **main recommendations** arising from the Mission are that:

- "1 A **working group** within the Government of Tuvalu be established to review housing policy and to prepare a strategy for housing development;
- "2 A **housing sector review** should identify issues and policy options, key resources and constraints (urbanisation, housing demand, affordability, services, access to land, financing and management), preliminary goals and objectives, and existing policies which influence decision making and strategic planning for housing. Any review should also include the preparation of short term action plans for selected high priority issues based on identified goals, objectives and related policies;
- "3 At the completion of a review of the housing sector it is expected that issues, options, resources and constraints will be **sufficiently well identified and documented to allow the Government of Tuvalu to:**
 - (i) formalise an appropriate housing policy together with objectives and strategies for implementation; and
 - (ii) prepare Project Requests to relevant donor countries for assistance with development of housing in accordance with adopted housing policy.
- "4 At the completion of the review of the housing sector, recommendations will be made as to future Australian participation in the Tuvalu housing project".

The 1991 endorsement by the Tuvalu Cabinet of the AIDAB Appraisal Report and Recommendations

18. By letter dated 25 June, 1991, the Secretary, Ministry of Foreign Affairs and Economic Planning, Tuvalu, advised AIDAB that **"the Dickson - Cholerton Report has been endorsed by the Cabinet. The recommended team task force to conduct the Tuvalu Housing Policy Review has been appointed.** The team consists of the Deputy Secretary to Government; Assistant Secretary of Works and Communications; Assistant Secretary of Home Affairs; Director of Works; Director of Agriculture; the Lands Officer in the Department of Home Affairs &

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Rural Development; and the Rural and Physical Planner in the Department of Economic Planning & Statistics."

19. The Tuvalu Government requested AIDAB to provide a consultant to assist the team / task force to review Tuvalu housing policies. **The Government attached Terms of Reference for the task force** which were the same as the Recommendations 2 and 3 of the 1990 AIDAB Dickson-Cholerton Appraisal Mission Report, quoted above herein.

The 1992 selection and commissioning of a consultant / advisor.

20. Following the Tuvalu Government's formal request, AIDAB followed standard operating procedures to select an appropriate consultant / advisor. The outcome of these procedures was the selection of Mr George Clarke to assist the Tuvalu Government to implement Recommendation 2 of the 1990 Appraisal Report. The selected advisor has had 38 years of experience in urban, rural and regional development research, planning and implementation. This experience includes much work in housing, in a large number of countries, both developing and industrialised, including Fiji, Papua New Guinea and Indonesia. It also includes experience in the economic, engineering, environmental, institutional and legal aspects of housing and development management. AIDAB signed a contract with Mr. Clarke on 30 April, 1992, appointing him to act as advisor assisting the Government of Tuvalu.

The Procedures of the Research to date

21. Mr Clarke has since lived in houses in Tuvalu for 6 weeks of intensive field work. He has inspected all the 26 Islets of Funafuti Atoll, and all the 8 Outer Islands except, because of shipping schedules, Niutao, and Nukufetau. A great volume of documentation, photographs, maps, plans and designs, notes of interviews and observations, has been collated and studied, including historical and cultural research material. All of this material has been analysed and studied in depth.

22. It was quickly discovered that the Tuvalu Lands Office had suffered from an apparent inadequacy of resources devoted to it since the late 1970's, in as much as basic, essential urban surveys, base maps, and plans of development executed, on Fongafale Islet, were either non-existent, inadequate, out of date, borrowed but not returned by a consultant from Noumea, or worn out from years of handling and use.

23. Those remaining were on fragile old tracing paper, or were obscure dyelines. Nine of the largest and most important were carried to Sydney and copied onto stable-base, heavy duty plastic, transparent film. The new transparencies were returned to the Tuvalu Lands Office. The cost of making the transparencies to conserve the 9 metre length (6.3 square metres area) of documents, was only \$105, but the logistics were complex.

Meetings of the Government's Task Force; and the 1992 Working Papers.

24. The advisor met with individual members of the Task Force on many occasions, and twice with the Task Force as a group: once in May and once in August, 1992.

25. In July, 1992, the advisor submitted 15 bound copies of 66 pages of Working Papers for discussion in draft form. These included a 45 page "**Housing Policy Issues Discussion Draft**". Three weeks later, at the second meeting with the Task Force, these were discussed.

26. They were also discussed with other Civil Servants, and with other relevant individuals such as the General Manager of the National Bank of Tuvalu, the General Secretary of the Church of Tuvalu, leaders of women's groups, and four expatriate engineering and architectural advisors who had lived and worked for years in Tuvalu, in the Public Works Division or the Tuvalu Maritime School.

The Findings of the advisor: Volume 1 of the advisor's report.

27. The field work, discussions, interviews and desk studies of the advisor have led to the compilation of Findings on matters of fact as surveyed and understood by the advisor. These Findings comprise Volume 1 of the advisor's report.

28. The advisor believes that these Findings constitute what the Terms of Reference describe as the "housing sector review". The Findings:

- (a) Review policies and decision making, at both the strategic planning level and day to day operations, in both the public and private sectors, in all relevant fields;
- (b) Identify issues, policy options, resources and constraints related to urbanisation, and to the development of housing, in Tuvalu; including land and housing needs, provision of services, standards, affordability, financing and management;
- (c) Investigate trends in population, migration, household formation and occupancy; and assess latent, and effective, demand for housing; and
- (d) Assess the economic and environmental sustainability of development styles.

Draft strategy, policies and priorities submitted by the advisor for consideration and discussion: Volume 2 of the advisor's report.

29. The advisor, in response to the Terms of Reference, here suggests a range of appropriate objectives, and a draft preliminary strategy and set of priorities to begin to address the issues identified in the Findings. Recommendations for short term action plans, for selected high priority issues, are included. These are submitted to the Government of Tuvalu for consideration and discussion.

30. The Findings indicate a need, 20 years after the production of Ball's 1973 comprehensive physical environmental development plan for Fongafale Islet, to produce another such co-ordinated land use plan and development design for the urban capital Islet; and to control land use and development accordingly. This should be done on the basis of revised national strategies to seek a style of development which is sustainable in economic and environmental capital, and recurrent, costs; and which is less centralised on Funafuti. That implies a need to set and monitor targets for the locational distribution of land use, investment, institutions, population, productive employment, infrastructure and locally built housing, among the 9 Atolls and Islands, and within each Islet, Atoll and Island.

31. The Findings also indicate that some very basic principles and forms of house design and construction can be derived from analysis of basic shelter and health needs in Tuvalu's climate, and of the limits of affordability. These forms include a 45° pitch well-ventilated, low-eaved roof over a raised floor platform, with all framing tied and pinned, preferably without the use of any metal which can corrode under any circumstances. They also include ideas about the design of tropical bathrooms and kitchens, and appropriate ways of conserving and dispensing water.

32. However, beyond those basic shelter principles, the Findings also indicate that ideas about the purposes and design of "a house", vary with different social, cultural and personal concepts of life and living in a particular environment, in a particular community, at a particular time.

33. Tuvalu has two, different, heritages of ideas about lifestyle and house design:

- (a) from Malayo-Polynesian tropical island South East Asia, via such islands as Samoa, & Kiribati; and
- (b) from the U.K., America, Australia & New Zealand, all temperate/cool climate, continental, industrialised, lifestyle and house design ideas.

34. The people of Tuvalu must evolve their own lifestyle and house design by learning about, discussing, selecting and experimenting with practical ideas from each of these heritages. This can only be achieved through a continuing cultural process, involving community participation and locally self-built housing. Thus, the name "LIFE & LIVING IN TUVALU" has been given to the programme, to make clear that it involves the whole community in evolving their own lifestyle.

Research Bibliography:

35. It is important that information be recorded, preserved and be available for use by present and future workers concerned with the future of Tuvalu. An annotated bibliography of 115 documents was included in the advisor's 1992 Working Papers. A Selected Bibliography, of the most useful and valuable documents, is in Appendix 2 to Volume 2: Strategies.

Findings 1:
LAND & OTHER RESOURCES PER PERSON:
Tuvalu & its neighbours in the Pacific

Tuvalu lacks the land & other resources per person that all of its Pacific Ocean neighbours enjoy. Therefore, Tuvalu cannot hope, & should not attempt, to copy any large scale, costly, land use, urbanisation, roads, traffic or other infrastructure model simply because such a model may have been tried, & might eventually be made economically and environmentally sustainable, in other places, even in other places which are also very close to the Equator, such as the Republic of Belau, Kiribati, Tokelau, the Federated States of Micronesia, the Marshall Islands, or Nauru.

	Area (km ²)	People (number)	People per km ²
Tokelau, 1990:	10.00	1,800	180
Nauru, 1990:	21.00	9,300	443
South Tarawa Islet, Kiribati 1990 Census, inc people on ships:	15.80	25,154	1,592
Fongafale Islet 1991 Census, exc people on ships:	1.60	3,744	2,340
South & North Tarawa Atoll 1990 Census, inc people on ships:	31.13	28,802	925
Funafuti Atoll 1991 Census, exc people on ships:	2.36	3,839	1,627
The 15 Outer Atolls & Islands of the Gilbert Group, Kiribati (exc Barnaba) 1990 Census:	248.30	38,385	155
The 8 Outer Atolls & Islands of Tuvalu, 1991 Census:	21.61	5,204	241
New Caledonia, 1990:	19,103.00	167,600	9
Niue, 1990:	259.00	2,500	10
Vanuatu, 1990:	12,190.00	146,400	12
Belau (Palau) 1990:	488.00	14,208	29
Fiji, 1990:	18,272.00	725,000	40
French Polynesia, 1990:	3,521.00	196,300	56
Western Samoa, 1990:	2,935.00	157,700	54
Cook Islands, 1990:	237.00	16,900	71
Kiribati, 1990 Census	717.10	72,298	101
Tonga, 1990:	747.00	96,300	129
Fed States of Micronesia, 1990:	701.00	107,900	154
Marshall Islands, 1990:	181.00	45,630	252
ALL TUVALU, 1991 Census	23.96	9,043	377

Sources: Censuses, Tuvalu 1991 & Kiribati 1990; the SPC Statistical Summary No. 12, Noumea 1991; & The Statesman's Yearbook 1991-1992.

Findings 2:
POPULATION GROWTH & DISTRIBUTION, 1876 to 1991,
projected to 2006 at 1979-91 rates of change

	FUNAFUTI ATOLL: 9.7% Nation's land		ALL TUVALU: 100% Nation's land	THE "OUTER ISLANDS" 90.3% Nation's land	
	people	%	people 100%	people	%
1862	possibly	10%	before Peruvian raid		
1876	146	6%	2,497	2,351	94%
1911	228	7%	3,084	2,856	93%
1931	413	10%	3,994	3,581	90%
1947	528	12%	4,487	3,959	88%
1963	687	13%	5,444	4,757	87%
1968	826	14%	5,782	4,956	86%
1973	871	15%	5,887	5,016	85%
1979	2,120	29%	7,347	5,227	71%
1991	3,839	42.5%	9,043	5,204	57.5%
1996	4,923	50%	9,862	4,939	50%
2001	6,313	59%	10,756	4,433	41%
2006	8,096	69%	11,731	3,635	31%

SOURCES & NOTES:

1979 Census Report, & 1991 Census Tables. 1979-91 population growth rates were 5.1% per annum on Funafuti Atoll; and 1.75% per annum for all TUVALU. Projections to 2006 are at those compounding annual rates.

The age and sex ratios, & fertility characteristics, of the 1991 Fongafale Islet population were highly similar to those of the "Outer Islands". Only the overcrowding was significantly different.

In 1991, 3,744 people, or 97.5% of Funafuti Atoll population, were on Fongafale Islet, a gross area of about 400 acres (160 ha). Little of this is available for housing. Most is in National & Island infrastructure & services, borrow pits, or inaccessible spits. About 100 acres (40 ha) was developed with 462 houses in 1991, with about 12 occupied houses on other Islets.

Findings 3:
LAND RESOURCES PER PERSON, 1876 to 1991,
projected to 2006 at 1979-91 rates of shrinkage

Ellice scholar I.A. Brady (1974) calculated that a minimum of 1 acre (0.4047 hectare) gross "lands" area per capita was essential to sustain basic human needs for environmental resources on Tuvalu's coral islands and atolls. Deforestation, & industrialised urban infrastructure & technology, increase the need for land per capita; industrialised food imports reduce it. But trees, fertile soil & usable land, cannot be imported. They must be created & maintained locally.

	FUNAFUTI ATOLL: 583ac or 236ha	ALL TUVALU: 5,921ac or 2,396ha	THE "OUTER ISLANDS" 5,338ac or 2,161ha
1862*	2.47 ac or 1 ha*		
1876	3.99 ac or 1.61 ha	2.37 ac or 0.96 ha	2.27 ac or 0.92 ha
1911	2.56	1.92	1.87
1931	1.41	1.48	1.49
1947	1.10	1.32	1.35
1963	0.85	1.09	1.12
1968	0.71	1.02	1.08
1973	0.67	1.01	1.06
1979	0.27	0.81	1.02
1991	0.15 ac Funafuti 0.10 ac Fongafale	0.65 ac	1.03 ac
1996	0.12	0.60	1.08
2001	0.09	0.55	1.20
2006	0.07 ac or 0.028 ha	0.50 ac or 0.204 ha	1.47 ac or 0.59 ha

SOURCES & NOTES:

OVERALL GROSS ISLAND AREAS: From the 1984 Report of the 1981-88 UN Cadastral Survey; probably includes all "land" above Mean High Water Mark, including all borrow pits, pulaka pits, airstrips and other infrastructure areas. Changes in Island Areas since 1876 are not known: most have probably grown. Deforestation on Fongafale Islet has probably caused erosion.

DE FACTO POPULATIONS: 1876 survey by London Missionary Society; 1911 to 1991 Censuses; 1991 to 2006 projections at 1979-91 growth rates (Funafuti 5.1% per annum; all Tuvalu 1.75% per annum).

*1862: estimated, before Peruvian kidnapping raid in 1863.

Findings 4a:

**PEOPLE DENSITIES OF ATOLLS & ISLANDS, 1931 to 1991,
projected to 2006 at 1979-91 rates of change, in people per acre**

PEOPLE PER GROSS ACRE OF EXISTING LANDS

	1931	1963	1979	1991*	2006
TUVALU:	.67	.92	1.24	1.53	1.96 people per acre
Funafuti Atoll:*	.71	1.18	3.64	6.58	13.89 people per acre
Fongafale Islet	1.00	1.72	5.14	9.36	19.00 people per acre
The 8 Outer Atolls & Islands:	.67	.89	.98	.97	.68 people per acre
The 4 Outer Atolls					
Nanumea	.87	1.19	.96	.93	
Nui	.50	.65	.74	.73	
Nukufetau	.52	.87	.82	.99	
Nukulaelae	.43	.77	.84	.86	
4 ATOLLS:	.61	.89	.85	.88	
The 4 Outer Islands					
Niutao	1.23	1.52	1.65	1.43	
Niulakita	.37	.42	.64	.74	
Nanumanga	.66	.85	.94	1.00	
Vaitupu	.59	.68	1.05	.99	
4 ISLANDS:	.74	.89	1.13	1.08	

1991* FUNAFUTI POPULATION & HOUSING BY ISLETS:

Funafala & Fualifeke Islets: about 15 people in 3 privately occupied houses.

Amatuku Islet: about 80 people in 8 or 9 staff houses & trainee dormitories.

Fongafale Islet: 3,744 people total on 400 gross Islet acres, inc. infrastructure, government & community services, food growing & gathering, borrow pit, & narrow spit areas. About 187 people in hospital, jail, hotel, civil service hostel, guest houses & maneapas. About 3,557 people in 462 privately occupied houses on about 100 acres of residential land, inc. access paths/roads.

Residential Area Densities are an average of about 4.6 houses per acre. There is an average of 7.7 people per privately occupied house. Thus, there are about 35.4 people per residential acre.

Findings 4b:

**PEOPLE DENSITIES OF ATOLLS & ISLANDS, 1931 to 1991,
projected to 2006 at 1979-91 rates of change, in people per hectare**

PEOPLE PER GROSS HECTARE OF EXISTING LANDS

	1931	1963	1979	1991*	2006
TUVALU:	1.66	2.27	3.06	3.78	4.84 people per hectare
Funafuti Atoll:*	1.75	2.92	8.99	16.26	34.32 people per hectare
Fongafale Islet	2.47	4.25	12.70	23.13	46.95 people per hectare
The 8 Outer Atolls & Islands:	1.65	2.20	2.42	2.40	1.68 people per hectare
The 4 Outer Atolls					
Nanumea	2.15	2.94	2.37	2.30	
Nui	1.24	1.60	1.83	1.83	
Nukufetau	1.28	2.15	2.03	2.45	
Nukulaelae	1.06	1.90	2.08	2.13	
4 ATOLLS:	1.50	2.20	2.10	2.17	
The 4 Outer Islands					
Niutao	3.04	3.76	4.08	3.53	
Niulakita	0.91	1.04	1.58	1.85	
Nanumanga	1.64	2.10	2.32	2.47	
Vaitupu	1.46	1.68	2.60	2.47	
4 ISLANDS:	1.83	2.20	2.79	2.67	

1991* FUNAFUTI POPULATION & HOUSING BY ISLETS:

Funafala & Fualifeke Islets: about 15 people in 3 privately occupied houses.

Amatuku Islet: about 80 people in 8 or 9 staff houses & trainee dormitories.

Fongafale Islet: 3,744 people total on 162 gross Islet hectares, inc. infrastructure, government & community services, food growing & gathering, borrow pit, & narrow spit areas. About 187 people in hospital, jail, hotel, civil service hostel, guest houses & maneapas. About 3,557 people in 462 privately occupied houses on about 40.47 ha of residential land, inc. access paths/roads.

Residential Area Densities average 11.4 houses per hectare, with an average of 7.7 people per privately occupied house. Thus, there are about 88.0 people per residential hectare.

Findings 5:**CAPITAL ASSETS IN TREES WHICH CREATE LAND, PROTECT LAND & SETTLEMENTS, & YIELD HOUSE BUILDING MATERIALS**

The following are some of the indigenous species most useful for: shoreline land protection & reclamation ramparts; shelterbelts against W, NW & N winds, wind-driven horizontal rains, sun, heat & glare; for canopy shade, air-conditioning, soil moisture retention, biomass, leaf compost, bird guano, & soil fertility; & for structural columns, beams, joists, rafters, poles, studs, tenons, pegs, pins, braces & ties. Many are now scarce or endangered. They have been depleted by deforestation without regeneration; by coconut (niu) monoculture; & by the proliferation of breadfruit (mei) trees. Breadfruit is no longer a fashionable food, because imported rice is easier to get, prepare & cook. On some Outer Islands, during breadfruit season, fruit rot on the ground; & breadfruit trees are being cut down. In some countries, coconut & breadfruit timbers have been much used for house building. Not so in Tuvalu, where they are said to be soft, & have traditionally been kept for food production. A fast-tracked tissue-culture regeneration & propagation programme is needed for a number of scarce & endangered species, to help implement future sustainable land use, infrastructure & housing plans & designs.

Tuvaluan & other names, major characteristics & uses	Numbers, timber volumes, age distributions, growth rates; capital value & harvestable yields; by Islands & Atolls 1972 1982 1992 2012
<ol style="list-style-type: none"> 1. FETAU; Alexandrian laurel; Calophyllum inophyllum; giant tree, strong, hard, heavy timber; 43 uses inc: shoreline protection & land reclamation ramparts; shelterbelts; canoe hulls; structural columns, beams, joists, rafters, ridgebeams. 2. KANAVA; Cordia subcordata; forest tree; 40 uses inc: structural columns, posts, studs & ties; furniture & lidded storage boxes. 3. PUKA, PUKA VAKA; 4. Hernandia peltata, & H. nymphaeaeifolia; light, easily workable, durable; 18 uses inc: canoe hulls; posts, beams, poles. 5. PUKA, PUKA VAI; Pisonia grandis; forest, shelter, multi-purpose; attracts nesting birds which drop guano, creating fertiliser & fertiliser industries; 17 uses overall; 6. nGIE; Pemphis acidula; colonises bare ocean side reef rock; v. hard, highly tensile; ramparts, canoe outriggers, hooks, husking sticks, spears, tools; structural joint tenons, pegs, pins, ties & braces; said to outlast (80 years) steel as reinforcing bars in structural concrete; 30 uses overall. 	<p>The UNDP/FAO University of Auckland "Tuvalu Land Resources Surveys", 9 Volumes 1985 et seq, documents & maps much of this data.</p> <p>Access to 1,093 reports on environmental science observations & research between 1883 & 1988 is also available through "The Biology & Geology of Tuvalu: an Annotated Bibliography" compiled by K.A. Rodgers (U. of Auckland) & Carol Cantrell (Australian Museum); Technical Report No 1 of The Australian Museum, Sydney, 1988; 103pp.</p>

7. **FALA; Pandanus (105 varieties in Tuvalu);** ramparts, structural posts & beams, thatch (leaves), food (fruit); 53 uses.
8. **nGASU, nGAHU, PUA GASA;**
9. **Scaevola sericea, S. koenigii,**
10. **S. taccada;** wild saltbushes; ramparts; long poles; 32 uses.
11. **MILO; Thespesia populnea;** structural posts, long fishing rods & building poles; 26 uses.
12. **SAnGALE; Lumnitzera littoria;** lagoon ramparts, poles, studs, stilts, drum sticks; 17 uses.
13. **TAUSUNU, TAUHUNU;** tree
14. **heliotrophe; Tournefortia argentea; Messerschmidia argentea;** ramparts; furniture; 23 uses.
15. **FAU, FAU TUU; Hibiscus tiliaceus;** ramparts, windbreaks, living hedges/fences; 57 uses.
16. **TOnGO; mangrove; Rizophora stylosa,**
17. **R. micronata;** land reclamation; fish breeding; building poles, frames, braces; thatching needles; 25 uses.
18. **PUA, PUA MOE; Guettarda speciosa;** firesticks, thatching needles, poles, tie-rafters; 36 uses.
19. **FELO; Ficus tinctoria; F. aspera;**
20. 21 uses inc: digging sticks, living shelter hedges.
21. **TOA; Casuarina equisetifolia;** Ironwood Tree; 22 uses inc: land reclamation.
22. **ALO ALO; Premna serratifolia,**
23. **P. obtusifolia, P. taitensis;**
24. 22 uses inc: land reclamation, living shelter hedges.

The particular uses of particular trees and shrubs, in building, housing, furniture, furnishings, ramparts and shelter belts, are detailed in: the GOT Report to UNCED (1991); Hockings (1989); Woolard (1988); Austin (1988); Chambers (1984) & (1975); Koch (1961); Kennedy (1931); Handy (1924); and Mrs Edgeworth David (1899).

Findings 6: LAND USE, INFRASTRUCTURE & HOUSING ON AMATUKU ISLET, FUNAFUTI ATOLL

Amatuku Islet is said to be about 12 acres (4.86 ha) gross area above High Water. It is separated from Tengako, once a separate Islet, but now the north tip of the North Spit of Fongafale Islet, by about 1 km of emerging coral reef, still under water. It is about 10 km by boat across the lagoon from Vaiaku.

The Tuvalu Maritime School (TMS) was established here in late 1979 & was Australian-funded under a program that ran to 1988. Compensation of AUD \$128,463 was paid to the landowners after a Parliamentary Commission of Enquiry. This secured for the Government either the ownership, or a long lease, of the Islet as a whole, which is now wholly occupied by the TMS. It appears that the land was valued at about \$10,700 per acre in about 1980.

The infrastructure, housing & the School as a whole, are all now of a high quality. There are either 8 or 9 staff houses, (government graded: 1"B"; 3 or 4"C"; & 4"D"); & dormitories for maritime trainees. The staff houses are among the best designed and most sophisticated tropical houses in Tuvalu, incorporating, for example, vented ridgelines & insulated roof slope ceilings to allow convection cooling. Galvanised metals are, however, starting to rust.

The trainees are under maritime discipline. The Islet's land, infrastructure & buildings are well managed & maintained. One or more Fetau trees have created or improved a small sandy beach on the oceanside near the staff houses.

There is a proposal to convert the TMS to a centralised, national vocational school teaching a wide range of subjects from carpentry to home economics.

This would create a transport problem for yet unknown numbers of day students & teachers & their equipment. It has been suggested that a road causeway might be built to link Amatuku across the 1 km of open reef to Tengako. Tengako, 3,000 metres long, & between 40 & 90 metres wide (including a 1,200 metre length of borrow pits) was originally a separate islet, now joined to Fongafale by a natural coral sand causeway about 10 metres wide.

A road would then be needed down the 3 km length of Tengako, & across the 400m long coral sand causeway which links Tengako to Fongafale. The existing 3.4 km of unformed track down the eroding lagoon edge of North Spit, to the Oil Depot & Wharf, would need to be upgraded & protected from the lagoon. From the Depot & Wharf there is currently a 3.2 km road to Vaiaku, with an unstable road base recently tar spread.

This could be a separate roads project, or combined with the proposal to build a new Airstrip & Airport on the lagoon alongside the North part of North Spit (Tengako). The capital & recurrent costs, & the environmental impacts, of these projects, would all be very large. Their economic & environmental sustainability is questionable, either separately or together.

For the expansion/conversion of the TMS on Amatuku, the Government's 1992-94 Development Strategy seeks to provide 3 additional staff houses there.

Findings 7: RESOURCES ON THE 24 MINOR ISLETS AROUND FUNAFUTI ATOLL

from North of Amatuku & Fongafale Islets, counterclockwise:

Islet name, size, & distance by lagoon from Vaiaku on Fongafale Islet	Notes on development; de facto population, occupied private & collective dwellings, 1979 & 1991; & recent aid requests of potential relevance
1. MULITEFALA: maybe 2 acres or 0.8 hectare; 10.8 km from Vaiaku	Mulitefala is a small islet 750 metres North West from the landing stage of the Tuvalu Maritime School on Amatuku Islet.
2. FUALIFEKE: maybe 20 ac or 8 ha; 13.5 km from Vaiaku across the lagoon	The November 1991 Census records 2 people living here, trying to raise chickens, but by August 1992, this use had been discontinued. There is a traditional style house & several other houses & sheds & a rainwater cistern; much solid waste (imported food & drink bottles); evidence of gardening; a few pigs; & good forest cover. Access is difficult at lower tides.
3. PAVA: a young, small islet; 14.25 km from Vaiaku	Coconut trees & elementary flora.
4. TE AFUALIKU: a young, small islet; 15.2 km from Vaiaku	Coconut trees & elementary flora.
5. TEPUKA: maybe 24 ac or 10 ha, round shaped; 14.6 km from Vaiaku NW across the lagoon	At the centre of this well forested & relatively fertile Islet, is a decaying bunker from World War II. German speculators recently asked for rights to develop this islet as a large tourist resort , & the owners were said to be pleased by the prospect. (There does not appear to be any law in Tuvalu which enables or requires the Government to control or limit any private use of private land). The Government's "1992-94 Development Strategy & Economic Framework" states on p.76 that "As part of the Tourism Infrastructure Project, presented to donors at the UNDP round table meeting in December 1991, six rooms of traditional architectural design are planned for development on Tepuka Islet". The proposed Development Bank of Tuvalu is envisaged to administer a Tourism Development Fund to support private business in tourist accommodation & service investments.
6. TEPUKA VILI VILI: a young emerging islet; 14.6 km from Vaiaku	6 young coconut trees & 12 seed coconuts, in August 1992. This islet is an engaging "tourist sight" on a lagoon trip, as an example of how reef islets emerge & begin to support coconut trees. It is understood that seed coconuts are placed there deliberately, & have not merely floated there.

Islet name, size, & distance by lagoon from Vaiaku on Fongafale Islet	Notes on development; de facto population, occupied private & collective dwellings, 1979 & 1991; & recent aid requests of potential relevance
<p>7. FUALOPA: about 255m x 80m; 2 hectares or 5 acres; 15.3 km from Vaiaku</p>	<p>Faulopa is well wooded, with trees & insect life that attract birds. It has much of the delicious & nutritious edible fern, lauluu (<i>Asplenium nidus</i>) which is not harvested. The reef edge has the best, most attractive & accessible, coral for viewing with a snorkel mask, in Funafuti. A rare living trochus shell was sighted on the outer reef edge. Fualopa is said to be visited by Funafuti people wishing to shoot birds. It is the popular day trip destination for expatriate picnic parties. Fualopa is subdivided into 3 lots, but is not settled.</p>
<p>8. FAUFATU: maybe 2 ha or 5 ac; 17.5 km west of Vaiaku</p>	<p>Shaped as an arc, around a small boat cove, Fuafatu is less well vegetated, & less accessible, than more regularly shaped islets. The entry to the cove is narrow & sharp edged.</p>
<p>9. VASAFUA: maybe 5 ac or 2 ha; 16.3 km from Vaiaku</p>	<p>A round shaped islet.</p>
<p>10. FUAGEA: maybe 2.5 ac or 1 ha; 15.3 km from Vaiaku</p>	<p>Access difficult at lower tides.</p>
<p>11. TEFALA: maybe 2 ac or 0.8 ha; 16.5 km from Vaiaku</p>	<p>Access difficult at lower tides.</p>
<p>12. The SW loop of 6 to 17. small islets;</p>	<p>This group, TUTA_nGA, AVALAU, MOTULOA, TELELE & 2 others, forms the southern pocket of Funafuti Lagoon, west of the long settled Islet of Funafala.</p>
<p>18. FUNAFALA: maybe 24 acres or 9.7 ha; 19 km from Vaiaku, the longest distance of all the islets</p>	<p>The southern tip of this very long & narrow islet has long been a satellite seasonal settlement for some Funafuti people, & as a place for a second, occasional, holiday or retirement home. In the 1890s, many Funafuti people spent the 3 months bonito fishing season of every year there, & had built a stone church, later demolished by a hurricane. David Ball, in the 1973 Advisory Physical Development Plan for Fongafale New Town, raised the possibility that to reduce overcrowding & land shortage on Fongafale, many Funafuti "Home Islanders" might prefer to have their village transplanted to Funafala, or to Funangongo, Islet. This would "enable them to retain much of their traditional way of life, relatively unmolested by urbanisation & the inconveniences & restrictions entailed, yet close enough to partake of many of its benefits, particularly paid employment". At that time, several heads of families were talking of rebuilding their houses on their agricultural lands rather than in the planned village on Fongafale. However, to date, the appeal of the "Mainland" has been overwhelming despite Government attempts to encourage development on Funafala & despite the overcrowding so far experienced on Fongafale. The November 1991 Census recorded only 13 people living on Funafala, & none on Funangongo: this may be a substantial fall from the number on Funafala in 1979.</p>

Islet name, size, & distance by lagoon from Vaiaku on Fongafale Islet	Notes on development; de facto population, occupied private & collective dwellings, 1979 & 1991; & recent aid requests of potential relevance
	In August 1992, there were about 12 or more traditional or self-built houses, a public water cistern, & a small maneapa, in the traditional settlement on the southern tip of Funafala Islet. Some houses were vacant, but there were more than 13 people staying or living there. It may be that Funafala is more comfortable in August than in November. In the future, more so than in the past, one of the alternatives to even greater land shortage & house overcrowding on Fongafale, may still be to continue to encourage or assist decentralisation by Funafuti landowners to islets around the Funafuti lagoon, such as Funafala, Funangongo & even Tepuka & Fualifeke.
19. LUA: 20. MATEIKA: narrow islets, 14.5 km	Narrow islets, without extensive fringing reefs, adjacent to an entry to the lagoon from the ocean.
21. FALAFATU: maybe 10 ac or 4 ha; 12.74 km from Vaiaku	Wider than Lua & Mateika, but also adjacent to a lagoon entry passage.
22. FUNAMANU: maybe 5 ac or 10 ha; 9 km from Vaiaku	Also adjacent to a passage through the reef.
23. FUNAnGOnGO: maybe 24 ac or 9.7 ha; only 6 km from Vaiaku	Also known as "Papaelise", this was the site of a school run by Sarah Joliffe between 1912 & 1920, closed when Mrs Joliffe left Tuvalu. Funangongo has a number of giant Fetau (<i>Calophyllum inophyllum</i>) trees as shoreline ramparts, which may be why this Islet is so wide (up to 168 metres or 560 feet). It seems to offer the best opportunities for the development of a satellite settlement to Fongafale, being large, wide, & close to Fongafale.
24. FATATO: maybe 15 ac or 6 ha; 4.5 km from Vaiaku	Fatato is only 1.2 km south of the southern tip of South Spit of Fongafale, and may also offer some possibility of settlement.

The gross land area of all these 24 Islets combined is probably about 171 acres or about 69 hectares.

Adding Amatuku (12 acres) and Fongafale Islet (400 acres) accounts for the overall gross land area of all of Funafuti Atoll, said by the 1984 Report of the 1981-88 UN Cadastral Survey to be 583 acres or 236 hectares.

DE FACTO POPULATION GROWTH 1979-91 ON FONGAFALE ISLET

1979:		1991:	
2,055	Total	3,744	Total (+82.2%)
inc 1,913	Polynesians	inc 3,547	Polynesians (+85.4%)
84	Other Pacific	56	I Kiribati)
58	Non Pacific	77	Europeans) (+39%)
	mostly Europeans	64	Others)

Polynesians (ie. Tuvaluans & Part Tuvaluans) are migrating to the centre of their cash economy from the "Outer Islands". They are returning to Tuvalu from contracts & jobs overseas, and are tending to stay on Fongafale Islet. Between 1979 & 1991, there was a fall in the number of Tuvaluans outside Tuvalu, from 1,381 in 1979 to only 1,230 in 1991. This excludes, in both years, those with permanent residence rights in Fiji and Kiribati. The percentage of non Polynesians on Fongafale has fallen from 7% to 5%, but they have increased in number from 142 to 197.

In 1979, the "Mainland" population was not balanced in age & sex ratios & fertility characteristics. By 1991, the "Mainland" population had age, sex & potential fertility characteristics almost identical to the total population. That will promote natural increase, & increase demand for infrastructure & services, & jobs.

VILLAGES, PRECINCTS & SPITS FROM SOUTH TO NORTH**1. SOUTH SPIT: from the south tip ("mata fenua") to the south end of the Airstrip & Vaiaku:**

Length: about 2.4 km, but 520 metres or 22% of this, in the northern half, is sterilised by a borrow pit tidal pond.

Width: from nil, to 90 metres at the Airstrip end, but mostly 45 to 50m. The wider northern end, under the Airstrip approach splay, has recently been cleared of all the few remaining low pandanus palm trees & young coconut trees, so as to remove safety obstructions. This area is developed with houses.

Area: about 26 acres (10.5 ha) gross, but with 22% sterilised by a 4 acre borrow pit.

The Airstrip has recently been lengthened a little southward, as well as being tar sealed. The 1972 Hurricane Bebe shingle bank, which has much eroded over the last 20 years, & runs alongside South Spit on the oceanside, is being used for crushing coral rock for aggregate & sand. Trucks traverse South Spit, & the crusher is noisy & dusty. The lagoon side is unprotected from erosion.

There is a cluster of relatively new, self built, affordable private houses (maybe 30) at the north end of the South Spit, close to the south end of the Airstrip. **Some of these are very good examples of traditional tropical Tuvaluan basic house design, materials & building technology.** These latter have mostly been designed & built by Ailima, the 52 year old daughter of the Niutao Master House-Builder (Tufunga fai Fale), Saipele, who won the world's respect through the publication in 1961 of Gerd Koch's book **The Material Culture of Tuvalu**. This book features drawings & photographs of several of Saipele's masterpieces, built while his daughter Ailima was in her late 'teens. Ailima is a migrant to the Mainland from Niutao: she is married to a Funafuti man, Sigano Talesi. Her brother, 48 year old Simiona, & sister Katepo, still live on Niutao.

The tree denuded, borrow-pitted, extractive industrial, flight path affected, narrow South Spit, however, does not offer much more potential for long term infrastructure, human settlement or housing. A 2.4 km road, & daily vehicular transport, could make development cost in-effective, & could quicken erosion, as the track/road on North Spit is causing erosion along the lagoon side.

Because the northern end of South Spit is accessible to Vaiaku across the southern end of the Airstrip, & the local mini-buses come down its unformed track, & because the land is privately owned & in small lots, it has attracted much "overspill", self-reliant, self-built, low cost, housing. Here is a good example of effective, small scale, productive private enterprise, albeit informal, quietly at work, satisfying real needs, efficiently & affordably, apparently entirely without Government subsidy or foreign aid. A few of the smaller National Bank of Tuvalu housing loans (at 11.5% p.a. over 7 years) may, however, be involved.

There are no further known aid project requests affecting South Spit, now that the Airstrip extension & tar-sealing, & the pandanus & coconut tree clearing, have been achieved. A major shoreline tree rampart/reclamation project, possibly using Fetau trees in association with others, is needed. The borrow pit problem still awaits solution.

2. VAIAKU, ALAPI, SENALA, FAKAIFOU & THE "FOODBELT": the township area planned in 1973 between the lagoon & the Airstrip

The only existing indicative map or plan of this whole area, seems still to be Mr David Ball's original draft sketch advisory 1973-83 Physical Development Plan. That was not closely followed; and the whole area was substantially developed, used or committed for use, by about 1980, three years ahead of schedule.

Since 1973, no overall base map has been produced to record what has been done. No overall survey, map or plan exists, neither cadastral nor topographic. **The physical development plan has never been effectively reviewed & up-dated.** Urban development & infrastructure continues to extend & intensify within & far beyond the original area, particularly to the north, but also to the south.

The compilation of a simple series of base maps of the main township area & of its ribbons of overspill development to the north & south, showing what exists, is the first essential & most urgent priority for any kind of effective community management, especially for land management, land use, infrastructure & housing

purposes: there may be less than 40 houses in Vaiaku now; of these, about 14 are still privately owned, on plots sub-leased by Government to Civil Servants in 1976 & 1977, probably still alienated for about another 20 years. Other houses in Vaiaku are "tied" houses: for the Governor General, Prime Minister & Ministers, etc. It seems that **there are irregularly shaped pieces of freehold land (not leased to Government) in Fakaifou**, with some private houses on them. There are still some unfilled borrow pits in Fakaifou. There are about 2 Maneapa (community halls) for people from 2 of the Outer Islands, in Fakaifou.

In Fakaifou, in 1992, there were only **144** house plots with "FF" numbers, presumably on Government-leased land. Of these, 70 are said to still be alienated on sub-leases to people (or their heirs) who were Civil Servants in 1976 & 1977. Two of those are now used for "home-stay" visitor lodging, with rooms let by the night to foreign visitors. One of those is also a restaurant.

A street block alongside the Airstrip, planned for 12 house plots & houses in the Ball Plan, was used for an Aircraft Hangar, now no longer used as such, but possibly as a Public Works Division store, or else is vacant.

The Ball Plan showed a 2 acre (0.83 ha) "Playing Field" possibly partly on traditional Communal Land (manafa fakagamua), partly on a borrow pit. This was not needed when people played sports on the grassed Airstrip. In late 1992, however, the Airstrip was tar sealed.

In 1988, three of the J.S. Hill houses were built in a corner of the "Playing Field". Before the Airstrip was tarred, the Government had a sketch subdivision plan showing 20 "industrial estate" lots on the remainder of the "Playing Field". The plots are about 280m² (3,000 ft²) each, with 3 metre wide pathways between them. Some of the land is not yet wholly filled. Some may still be Communal Land. It has recently been suggested by some Civil Servants that these could now be used for new houses for Civil Servants. This area of about 1.7 acres (0.7 ha) for a maximum of 20 very small house plots on the remainder of the originally planned "Playing Fields", appears to be the only area remaining of Government controlled land on Fongafale Islet where the Government can now seek to build more houses for Civil Servants.

The best estimates that can be made from existing partial surveys & field inspections during August 1992, appear to indicate that there are about **147** house plots & houses on Government leased land in Fakaifou. Of these 70 are still alienated. There may be other private lots & houses on "freehold" remnants. Up to 20 more small house plots could be created on the original playfields site. In Vaiaku, there are possibly up to 40 house lots still used for houses, of which 14 seem to be still alienated & at least 8 are "tied".

Thus, for rental to expatriate advisors, indigenous Civil Servants & possibly other Government employees, the Government may still have up to 22 houses in Vaiaku, & up to 77 in Fakaifou, a total of about 99. This estimate comes roughly close to the data on Government owned houses quoted by the Higher Executive Officer: Personnel, in the Office of the Prime Minister (see Findings 15); ie. that the Government owned, in August 1992, a total of 90 houses & 1 hostel, for rental, on Fongafale Islet, in addition to "tied" houses.

Many of the Government owned rental houses, as well as many privately owned houses, are showing signs of wear, tear & design & equipment unsustainability & obsolescence, even though most of them are only about 15 years old, & many are less than that. A major repair, renovation & up-dating program is needed for older houses, quite apart from consideration of how many additional houses, where, of what design, at what cost, can or should be provided, on what terms of finance & tenure, by whom, for whom.

3. **NORTH SPIT:** from the north boundary of Fakaifou up to the Australian funded Main Wharf, the Customs Warehouse & the Oil Depot (ex BP); & on up the further North Spit to the causeway to Tengako, & to the north tip (mata fenua) of Tengako, opposite Amatuku Islet

Length: about 7.75 km overall:

1,300 metres (inc. 600m of borrow pits), from Fakaifou to Main Wharf;
2,600 metres on (inc. 600m of borrow pits) to the new Church School next door to Hideaway Home Stay;
600 metres on, to the sand causeway to Tengako;
300 metres of sand causeway;
3,000 metres on (inc 1,200m of borrow pits) to the north tip of Tengako, opposite Amatuku Islet.

Width: 140 metres across the north boundary of Fakaifou, narrowing quickly to a median width of about 60 metres. Borrow pits are slowly being indiscriminately filled with variegated solid waste.

Land Use & Urbanisation: A ribbon of urban development & housing reaches to the Fisheries complex, Customs Warehouse, Main Wharf & Oil Depot. This is a heavy traffic generator.

The "roads" (permissive vehicle access ways) between the Main Wharf & Vaiaku were given a coating of tar in 1991, on top of the poorly graded, unevenly particle-sized, unevenly drained, coral bed. The public transport mini-buses shuttle between the Main Wharf & Vaiaku, but do not yet attempt to go further north.

The Church of Tuvalu is acquiring & importing 4 large buses to run its own transport system from Vaiaku to the large new Church High School (260 pupils) now built 6 km north of Vaiaku, 2.6 km north of the Main Wharf. Children from the township were ferried up & down each day in the first bus to be delivered & in a number of trucks, during August 1992.

The rough & deteriorating track north of the Main Wharf is unformed, & mostly along the lagoon edge, where thin lines of coconut palms have proven inadequate to prevent erosion.

Private investment in the development of substantial houses is quite quickly growing along the North Spit, between the Main Wharf & the new High School. A goodly number are in reinforced concrete frame. Most are being built & occupied in slow stages, in line with available cash flow & borrow pit filling. Pig

& chicken pens are common alongside the borrow pits. North Spit attracts development because it still has some significant vacant area left for easy development, & also because it currently still enjoys higher amenity than either South Spit or the congested township area. It is attracting the higher cash income group, who can also afford the additional transport costs.

The capital & recurrent costs of daily traffic & transport, & the wear & tear on heavy vehicles & on "roads", caused by the ex-centric location of the new High School, imposes heavy burdens on school users, supporters & donors, & on the Government & community as a whole.

The redevelopment of a site closer to the centre of the School's daily "trade area", might have been possible, using land exchanges. If it is eventually to be a boarding school, a location on an Outer Island might have been more sensible, following the long established & successful precedent of the boarding High School on Vaitupu Island, now the Government's national High School. That would have conserved scarce land & food on Fongafale for Funafuti people & for those non-Funafuti people who must live, eat & be housed on Fongafale in order to continue the central functions of Government.

Before locational decisions are made, & approvals given, it would be wise in future to consider the community's overall sustainable development, & the optimum pattern of land use, housing & traffic. This applies to any proposal to convert the Tuvalu Maritime School (now a live-in residential, boarding school) to a general purpose, technical/vocational school for day pupils and a variety of trainers, all of whom could have variable schedules and transport demands. Such a major land use decision should only be made as part of an overall land use and traffic planning process.

If land use, housing & traffic planning & management were to be considered, efforts would be made to locate major traffic generators as close as possible to the centre of gravity of the traffic they generate.

It appears that Tuvalu has not yet enacted any law or adopted any Statutory Ordinance which clearly enables or requires the Government to control (ie. to permit subject to conditions, or to prohibit) any particular degree or type of private use or development of private land. In the modern world, this is now essential in every urban area, even in small ones like Fongafale.

Tuvalu's Customs Law already empowers the Government to regulate the import and entry of motor vehicles. The ideal physical environment for living today, in the most modern, advanced, sophisticated, urban areas in the world, is one in which one can go anywhere within one's neighbourhood or urban village, by walking along shaded, traffic-safe footways, &/or bicycling along shaded, traffic-safe bicycling ways. The small size, & flatness, of Tuvaluan communities enable Tuvaluans to give themselves, in this respect, the highest standard of living (& of physical fitness) in the world. In doing so, they would also create a "tourist attraction" of international prestige.

Findings 9:

THE FONGAFALE AIRSTRIP & OCEANSIDE, & the future of international tourism, internal migration, urban development, housing & visitor accommodation

A completely new Airport on the lagoon reef alongside Tengako has been suggested by some people, in order to: (a) clear the existing Airstrip, & some of its Oceanside, for new urban development; and (b) provide for future use by airplanes carrying 140 to 400 passengers instead of the 48 to 64 or more seat planes which can use the existing Airstrip.

The existing Airstrip & Oceanside area is as follows:

Length: available partial survey maps indicate an overall length of about 1,800 metres, with some minor extension possible down South Spit.

Width: about 100 metres or possibly 130 metres at the south end, widening to about 350 metres at the widest point. The Airstrip itself is about 100 metres overall width.

Area: generally said to be about 100 acres, with about half in the Airstrip, & half between the Airstrip & what remains of the shingle bank thrown up by Hurricane Bebe in 1972, much of which has since eroded, & some of which has been used. The widest, northern part, of the Oceanside area, is still occupied by a very large borrow pit, which once may have served as a turtle pond. Most of the rest is occupied by the new Public Works complex, the Electricity Generating Works, the Meteorological Station, the Prison, the Coral Rock Crusher, & the old Telecom Station. The area is directly exposed to strong prevailing winds, and to storm surges from the oceanic east and south east. Four people were killed at the Met Station by the 15m high storm surge of Cyclone Bebe in October, 1972.

During 1992, the coral base of the Airstrip appears to have been relaid with a well graded mix of particles obtained by crushing coral rocks from the oceanside Bebe Bank, & to have been well surfaced with bitumen. It also appears to have been lengthened slightly, provided with an airplane parking apron so that it can be used safely by more than 1 airplane at a time, & provided with a new terminal building. The supervising engineer states that the bitumen surface should now not require maintenance for 10 or more years, & that there is no plan for any hot mix plant to remain on Fongafale.

Operational safety considerations do not appear now to require the relocation or enlargement of the Airstrip. The 1973 Ball Plan recommendations to keep the height of nearby buildings & structures (eg. the radio aerial masts "farm" & the 2 storey National Bank of Tuvalu) below the international standard safety splay planes, were unfortunately not followed; but the scrubby pandanus & young coconut palms on South Spit have now been cleared, & the Oceanside remains

safely deforested except for the radio masts, the Meteorological Station, the Prison, the new Public Works Division office, workshop & store complex, the Electricity Generators, the old Telecom Station, & the Coral Rock Crusher. The relative safety of operating the Airstrip, particularly with the 1992 improvements, seems to be universally accepted. Advances in communications technology are said to make it possible to remove or relocate the radio aerial masts, apparently the highest, & thus most dangerous, obstruction.

Although many Tuvalu air transport, travel, airport, tourism & related studies have been completed over recent decades, & more are either in progress or sought, it is clear that there is not now, nor could be in the foreseeable future, any effective demand for any greater international air travel capacity than can be provided using the existing Airstrip. Existing 48 seat aircraft on current schedules could be replaced by 64 or more seat aircraft. Any potential increase in weekly demand could more efficiently be met by more frequent services by existing or new aircraft which can use the existing Airstrip.

Inter-island air transport has long been desired, & may or may not be possible at some future time. If Airstrips could be built on any of the 8 Outer Islands, & land-based inter-island air services were funded, it would appear that they would only be able, with acceptable operating economy & efficiency, to operate from the existing Airstrip close to the centre of gravity of Fongafale & Funafuti. If seaplane services were ever re-introduced, they would use the lagoon.

The over-riding factors which determine the size of airplane to be used on any route, & the frequency of services, & the volumes of people and goods to be transported, are NOT normally the length or size of any Airstrip. Nor are they limited by number of rooms or houses immediately available for visitors. The limiting factors include the nature & volume & frequency of effective (ie. economic, affordable, paid for) demand. This in turn is limited by the cost per kilometre charged, and the numbers of kilometres, which are all very high on add-on off-trunk routes to Fongafale from Fiji, the Marshalls or Nauru.

Tourism demand, by those able to pay much higher overall fares than fares to competitive & closer destinations, is limited by the environmental quality, attractiveness & uniqueness, as well as by the absorptive capacity, of places within economic distances from the destination Airstrip. Effective tourism demand also depends heavily on the amount, quality & cost of attractive food at the destination.

No amount of new, very long, Airstrips or Airports, & no amount of highly capitalised new roads, transport vehicles, tourist accommodation, hotels or the like, would have any positive effect on these constraints on Fongafale or Funafuti, or Tuvalu as a whole. They would merely reduce environmental attractiveness & the food supply. The absorptive capacity of Fongafale, in local transport, traffic, food, accommodation & sustainable environmental attractions, could not cope with more people on one day or in one week than could now arrive in planes that use, or could use, the existing Airstrip.

The attraction of paying much higher than competitive destination costs to visit Tuvalu would be to experience an unspoilt natural, maritime, lagoon, coral islet or island environment, in "traditional indigenous" styled accommodation & surroundings, with fresh food & natural environmental experiences, if & when these experiences are no longer obtainable in competitive, less distant & isolated, more "developed" places.

This indicates a greater potential feasibility for ship or boat based tourism, on floating accommodation. There could also be "ecological & environmental experiences" offered in overnight stays in traditional tropical "fales" on outer islets or islands, particularly those accessible from Tuvalu's only navigable lagoons, Funafuti & Nukufetau.

Some small-scale "eco-tourism" (ecological tourism) may be marginally economically feasible on Funafuti Islets such as Tepuka, Funangongo or Funafala, but "eco-tourism" is no longer possible on Fongafale. Such small scale, air-served, development on Funafuti outer islets would not require larger sized planes than could use the existing Airstrip. Neither would ship-served tourism.

Modern technology, & large amounts of capital, could technically build a jetport on the lagoon adjacent to Tengako & the North Spit of Fongafale, if there was ever likely to be any economic or other achievable purpose in so doing. The economic & environmental impacts could be, at great cost, calculated in great detail. Prominent among them would be the capital & recurrent economic, environmental & social costs of roads, traffic & vehicular transport to & from the new airport, along the very long, very narrow, North Spit.

Similarly, modern technology & large amounts of capital, could dig up & revegetate the existing bituminised Airstrip, fill the large Oceanside "turtle pond", & develop a new town on the possibly 70 or so eventually useable acres (28 ha) of the existing Airstrip & Oceanside. If half of this was used for non-residential uses, & half for new housing, about another 1,250 residents could be squeezed in, but only with unsustainable economic, environmental, nutritional, social, storm-surge disaster-risk, impacts.

However, it is not yet clear that, even if the capital for these projects was freely available as grant aid, the Tuvaluan people or Government would accept that it would be economically, environmentally, nutritionally or socially sustainable or desirable to further depopulate the 8 Outer Atolls & Islands by encouraging a continuing large migratory flow of Tuvaluans from the Outer Atolls & Islands to the already over-stressed Fongafale Islet.

In the light of the above, it would appear not to be fruitful to pursue, at least for the purposes of this current exercise, those suggestions that a solution to Tuvalu's current or future human settlement, land & housing problems might be sought by relocating the existing Airstrip & redeveloping it & the remaining parts of the Oceanside, for major new urban development.

Findings 10:**OCCUPIED HOUSES, & PEOPLE ACTUALLY LIVING IN OCCUPIED HOUSES, 1979 & 1991, on Funafuti Atoll, & on the 8 Outer Atolls & Islands**

The 1979 & 1991 Censuses report, or allow calculation of: (a) **The actual number of occupied houses;** excluding vacant houses, houses under construction, & "collective" dwellings such as the Motufua School Dormitories on Vaitupu Island, & the TMS Dormitories, the Hospital, Prison, Hotel, Hostel & similar establishments on Funafuti Atoll; & (b) **The actual number of human beings, including foreigners, living in occupied houses** but not in "collective" dwellings such as School Dormitories & the like.

	1979 no.	1991 no.	Change %
THE 8 OUTER ATOLLS & ISLANDS:			
No of people living in collective dwellings:	263	263	nil
No of people living in privately occupied houses:	4,964	4,944	-0.5%
No of privately occupied houses:	802	978	+22%
Average no of people per privately occupied house:	6.2	5.1	-18%
ALL TUVALU:			
No of people living in collective dwellings:	340	450	+32%
No of people living in privately occupied houses:	7,007	8,593	+23%
No of privately occupied houses:	1,103	1,452	+32%
Average no of people per privately occupied house:	6.35	5.91	-7%
FUNAFUTI ATOLL:			
No of people living in collective dwellings:	77	187	+143%
No of people living in privately occupied houses:	2,043	3,652	+79%
No of privately occupied houses:	301	474	+57%
Average no of people per privately occupied house:	6.8	7.7	+13%

It seems that any "housing problem" in Tuvalu now exists only on Fongafale Islet.

Findings 11:
HOUSE & PLOT TENURE OF OCCUPIED HOUSES, 1979 & 1991;
on Funafuti Atoll, and on the 8 Outer Atolls and Islands

The Censuses report significant increases in owner-occupied housing. There were also some additional houses vacant & under construction in 1991 & 1992. In all Tuvalu, 85% of occupied houses are owner-occupied. On Funafuti, there has been a rise in owner occupancy, to close to 74%: many houses originally intended for transient Civil Servants have become owner-occupied.

	1979		1991		Change
	no.	%	no.	%	%
8 OUTER ATOLLS & ISLANDS	795	100%	978	100%	+23%
Own house & land:	375	47%	641	66%	+71%
Own house not land:	345	43%	249	25%	-28%
Borrowed house & land:	43	6%	35	4%	-19%
Rented house & land:	32	4%	47	5%	+47%
Other & not stated:			6		
ALL TUVALU:	1,079	100%	1,452	100%	+35%
Own house & land:	490	45%	880	61%	+80%
Own house not land:	388	36%	354	24%	-9%
Borrowed house & land:	71	7%	81	6%	+14%
Rented house & land:	130	12%	120	8%	-8%
Other & not stated:			17	1%	
FUNAFUTI ATOLL:	284	100%	474	100%	+67%
Own house & land:	115	40%	239	51%	+108%
Own house not land:	43	15%	105	22%	+144%
Borrowed house & land:	28	10%	*46	10%	+64%
Rented house & land:	98	35%	*73	15%	-25%
Other & not stated:			*11	2%	

* On Funafuti Atoll in 1991, there were at least 99 Central Government-owned houses rented to Civil Servants or expatriates, plus at least another 8 "tied", allocated or rented to office holders such as the G.G., P.M., Ministers, the Speaker & the Attorney-General; a total of at least 107.

Findings 12:**GROWTH IN NUMBERS OF PEOPLE DIRECTLY EMPLOYED BY GOVERNMENT, 1976 to 1992; & IN ALL EMPLOYEES, 1979 to 1991; & in their centralisation on Fongafale & Amatuku Islets of Funafuti Atoll**

	June 1976	June 1981	June 1986	June 1991	June 1992
Established Civil Service Posts on the Civil List:	224	362	408	485	514
as a percentage of National Population:	3.3%	4.7%	4.9%	5.4%	5.6%
Duty Stations on) number: or via Funafuti) per cent: inc. Nivaga & Suva)	126 56%			342 70.5%	366 71.2%
1. Number of Established Posts actually filled:	203	304	343	386	414
2. Number of actual "Classified Government Workers":	84	149	167	180	?
3. Number of actual employees of Govt. Enterprises & Corporations:	32	75	110	88	?
4. Number of Expatriates working for Govt., not included above:	7	16	41	24	?
TOTALS of 1 to 4 above, ALL DIRECT EMPLOYMENT BY GOVT:	326 65%?	544	661	678 80%?	710+? 80%+?

PERCENT on FUNAFUTI:*SOURCES: National Development Plans 1978 to 1992.*

Censuses	May 1979		Nov 1991	
All Resident Tuvaluan Wage & Salary employees:	no;	% of pop:	no;	% of pop:
on Funafuti:	645	30.4%	936	24.4%
on Outer Islands:	246	4.7%	445	8.6%
TUVALU as a whole:	891	12.1%	1,381	15.3%

Findings 13:**GROWTH & INCREASING CENTRALISATION OF ESTABLISHED CIVIL SERVICE POSTS & DUTY STATIONS, from 1991 to 1992**

		Number of Established Civil Service Posts	
		1991 total:	1992 total, of which vacant:
Offices of the G.G. & the P.M., & Ministry of Foreign Affairs & Economic Planning:			
Duty Stations:	Outer Islands:	nil	nil, nil
	Funafuti (inc. 5 in Suva):	67	69, 8
Ministry of Finance, Commerce & Public Corporations:			
Duty Stations:	Outer Islands:	nil	nil, nil
	Funafuti:	41	62, 27
Ministry of Labour, Works & Communications:			
Duty Stations:	Outer Islands:	17	18, 8
	Funafuti (inc. 7 on Nivaga):	72	73, 16
Ministry of Health & Human Resources:			
Duty Stations:	Outer Islands:	96	96, 14
	Funafuti:	82	82, 12
Ministry of Natural Resources; & Ministry of Home Affairs & Rural Development:			
Duty Stations:	Outer Islands:	30	34, 4
	Funafuti:	80	80, 11
ALL OUTER ISLANDS: per cent of totals:		29.5%	28.8% 26%
	numbers:	143	148, 26
ALL FUNAFUTI: per cent of totals:		70.5%	71.2% 74%
	numbers:	342	366, 74
ALL CIVIL SERVICE: Total Posts:		485	514, 100
	Total Filled:	386	414
Increase in Filled Posts in 1 Year:			7.25%

SOURCE: The Civil List, June 1991; & June 1992.

Findings 14:**THE CIVIL SERVANTS HOME OWNERSHIP SCHEME 1976 to 1992:**

a subsidised loan & grant scheme which enabled those people who were Civil Servants in 1976 & 1977 to acquire the ownership of a house, and also, a 99 year sub-lease of a house plot on Government-leased land.

1976-77: A total of 174 of the then Civil Servants (1976 total: less than 224) & staff of the Tuvalu Co-operative Society & of the Meteorological Service, acquired ownership of houses & many also acquired 99 year sub-leases of house plots on Government-leased land. 152 of these were on Fongafale, in the new township of Vaiaku & Fakaifou, Alapi & Senala; maybe about 60% of all the non-traditional houses on Funafuti. 22 were on Vaitupu Island. In 1978 the scheme was closed to new entrants.

1982: Two dropped out, 1 on Fongafale, 1 on Vaitupu, leaving 172:

Alienated 99 year sub-leased
house-plots in Vaiaku
& Fakaifou:

113 maybe 60% of the then total

Private houses on private
plots in Alapi & Senala:

38 maybe 30% of the then total

Sub-total on Fongafale

151 maybe 48% of the then total

Sub-total on Vaitupu

21

1982-92: A "buyback" scheme was started. The 99 year sub-leases were cancelled, and new 25 year house plot sub-leases were issued from dates in the second half of the 1980s.

Feb 1991: The Minister for Works was reported in the "Tuvalu Echo" as proposing that people with private buildings (other than living houses) now on Government-leased or acquired land, would be treated as if the land was private. The building owners would then have to negotiate with the original private landowners, ie. the Government would give up its lease or acquisition of those plots. Where a person owns a house on a plot sub-leased to that person by the Government, the Government would offer to buy the house. If the house owner refuses to sell, the Government would give up its head lease, & the plot would revert back to the original landowner(s).

Aug 1992: The remaining alienated house plots on Fongafale were said to be:

Vaiaku: 14)
Fakaifou: 70)

**TOTAL 84, still about 45% of about
187 house plots on Government-
leased land in Vaiaku & Fakaifou**

The position in Alapi & Senala, & on Vaitupu, is not known. In 1991, 11 Civil Servants or ex-Civil Servants (or their heirs) had not yet completed repaying their concessional loans.

Sources: The Office of the Prime Minister; and the Lands Officer.

Findings 15:**CENTRAL-GOVERNMENT-OWNED HOUSES, 1979 to 1993; & LOCAL-ISLAND COUNCIL-OWNED HOUSES****(a) Central Government Owned Houses on Funafuti & Vaitupu**

- 1979:** 48 houses, of which "24 were occupied by Ministers or reserved for expatriate Civil Servants or Advisors." All 48, presumably, were in Vaiaku & Fakaifou, Fongafale, Funafuti.
- 1989:** 111 houses, presumably excluding about 8 "tied" houses, for the Governor-General, the Prime Minister, the Speaker, 4 Ministers & the Attorney-General.
- Fongafale:** 89, graded: 2"A"; 9"B"; 26"C"; 6 special "D"; 13"D"; 33"E".
The 6 special D were J.S. Hill houses funded by Australia, 1988.
1 "E" was a 1985 PWD "prototype" funded by Australia.
- Amatuku:** 9, graded: 1"B"; 4"C"; 4"D", all funded by Australia, 1979+ for TMS.
- Vaitupu:** 13, graded: 1"B"; 10"C"; 2"D".
(1 seems to have since been given to the Local Island Council)
- Aug 1992:** 110 or 111 houses, 1 hostel, & 3 classrooms for conversion to 6 houses; but presumably excluding the 8 "tied" houses.
- Fongafale:** 90 & 1 hostel, graded: 2"A"; 9"B"; 27"C"; 6 special "D"; 13 "D"; 33"E"; & 1 hostel. In Fakaifou, there are also 3 fully imported J.S. Hill classrooms funded by Australia in 1989. Two are 106m², & one 133m². These are scheduled now to be converted into three pairs of houses.
- Amatuku:** 8 or 9, graded: 1 "B"; 3 or 4 "C"; 4 "D", occupied by TMS staff.
- Vaitupu:** 12 (7 at Motufoua School (+ dormitories for 260 pupils), & 5 for Agriculture Station), graded: 1"B"; 9"C"; 2"D".

(b) Local Island Council Owned Houses on Funafuti & the 8 Outer Islands

The above totals exclude all those houses & guest houses on all Islands & Atolls which have been given over to, or built by, & are now controlled or owned by Island Councils & used by Civil Servants &/or Island Council staff stationed on those Islands & Atolls, & by visiting staff. Most have been built by the Island Councils themselves, often in partly or wholly indigenous style. No comprehensive data is available, but a number of these houses have been inspected. Most are good: the least practical & least comfortable are the 5 most expensive & most "modern", ie. the 4 J.S. Hill houses (1 each on Nanumea, Niutao, Nui & Nukufetau), & the Public Works "prototype" built for the Schoolteacher on Nukulaelae; these 5 were funded by Australia (3) & New Zealand (2). In 1992, there were 122 Civil Servants living & working on the 8 Outer Islands. At least 12 were in Central Government houses on Vaitupu. The other 110 may mostly live in Local Island Council owned houses. Some, like the Civil Servant Schoolteacher on Nukulaelae, have a family house on the same Islet, as well as a Council owned house "tied" to the position they currently occupy.

Findings 16:
NATIONAL BANK OF TUVALU HOUSING LOANS:
preferred lending guidelines & actual loans made

Applicants with a salary in excess of \$3,000 pa may be committed to **40% of net joint income**.

Applicants earning less than \$3,000 may be committed to **25% of net joint income**.

Maximum term of unsecured housing loans is currently 7 years. Security over land is not available under current law. The ability of the Bank to provide long term finance is limited by the unavailability of suitable security over property.

Interest rate for the time being is 11.5%. This rate has remained unchanged for the past six years.

Where security is offered, by way of cash deposit or supported guarantee, term may be extended to 15 years.

Whilst it is not necessary for the applicant to provide a deposit, they must have a satisfactory work and credit history.

The property financed by any loan should be, & remain, insured during the term of the loan.

TABLE OF REPAYMENTS				
Principal	Rate	Term	Repayment (per month)	Income Required per annum
\$1,000	11.5%	7 yrs	\$18	
\$5,000	"	"	\$88	\$3,000 (min)
\$10,000	"	"	\$176	\$5,400 (min)
\$20,000	"	"	\$353	\$14,900 (min)
\$1,000	11.5%	15 yrs	\$12	
\$5,000	"	"	\$60	\$3,000 (min)
\$10,000	"	"	\$120	\$4,000 (min)
\$20,000	"	"	\$240	\$9,200 (min)

TOTAL LOANS MADE BY THE NATIONAL BANK OF TUVALU

	1992	1991	1990	1989
TERM LOANS:				
New Loans:				
Number	1,029	1,103	1,066	1,011
Value	\$ 912,306	\$614,906	\$640,852	\$491,583
Increases:				
Number	2,536	2,155	1,913	1,397
Value	\$993,578	\$923,434	\$935,040	\$616,602
Total:				
Number	3,565	3,256	2,979	2,408
Total Value	\$1,905,884	\$1,538,340	\$1,575,892	\$1,108,184
Average Value	\$535	\$472	\$529	\$460
MAJOR CATEGORIES:				
Housing:				
Number	275	* 346	513	322
Total Value	\$449,012	* \$446,716	\$721,640	\$405,499
Average Value	\$1,633	\$1,291	\$1,406	\$1,259
Travelling:				
Number	584	556	487	492
Total Value	\$328,870	\$282,125	\$213,609	\$182,446
Average Value	\$563	\$507	\$438	\$371
Education:				
Number	337	267	279	202
Total Value	\$100,602	\$90,776	\$83,903	\$68,162
Average Value	\$299	\$340	\$301	\$337
Other Categories, inc vehicles & motorbikes:				
Number	2,369	2,087	1,700	1,392
Total Value	\$1,025,031	\$718,723	\$556,740	\$452,077
Average Value	\$433	\$344	\$327	\$325

* "About 75%" of housing loans have been for housing on Funafuti. However, the percentage going to Outer Islands is expected to increase (a) because of land shortage on Funafuti; and (b) because seamen are sending remittances to outer islands to start new house projects.

Findings 17:**AFFORDABLE HOUSE MORTGAGE LOANS FOR INDIVIDUALS WHO PAY (for only 15 years) NO MORE THAN CIVIL SERVANTS' 1992 SUBSIDISED HOUSE & PLOT RENTALS**

(a) 1992 Civil Service Salary Scale (before tax) mid range at each Level	(b) 1992 House Grade & subsidised house & plot rental inc. maintenance by Public Works Division	(c) 1992 The same amounts would fully repay a secured Bank Loan over 15 years @ 11.5% p.a., for the following capital amounts, to buy or build a privately owned, maintained & saleable house
\$ per annum (monthly amounts x 12)		\$ capital amount (received up front)
Levels:	["A" grade houses are for Ministers]	(c) = (b) x 7.001
1. 11,418	B: 1,322 (11.5% salary)	9,255
2. 10,896	B: 1,322 (12.1% salary)	9,255
3. 10,260	B: 1,322 (12.9% salary)	9,255
4. 8,964	C: 801 (8.9% salary)	5,608
5. 8,046	C: 801 (10.0% salary)	5,608
6. 6,930	SD: 612 (8.8% salary)	4,282
7. 5,952	D: 576 (9.7% salary)	4,033
8. 5,094	E: 360 (7.1% salary)	2,520
9. 4,074	E: 360 (8.8% salary)	2,520
10. 2,932	E: 360 (12.3% salary)	2,520

In the industrialised world, it has long been an accepted rule of thumb that people can afford, & should pay, 20% of their annual income, for housing. This has, in recent decades, in many developed countries, been raised to 30%. In Tuvalu, for Civil Servants, it is currently only between 7% and 13% for Civil Service house and plot rentals including repairs & maintenance by the Public Works Division.

The Lending Rate of the National Bank of Tuvalu has been 11.5% for the past 6 years. Bank Loans could be secured either by Government Guarantee or by a mortgage over land plot title, if current policies &/or law were amended.

A borrower benefits from any & all dollar inflation & devaluation, & from salary rises. A renter must expect rent increases & does not benefit from capital gains in house & land values.

During 1992, middle class Tuvaluans, on a number of Islands, built themselves spacious, appropriate, aluminium roof, unwallled, hybrid modern/traditional houses for about \$10,000 to \$11,000. The fully imported J.S. Hill "hot box" houses would cost at least between \$50,000 & \$75,000 each in 1992.

The 1992 donor-funded pre-cut house materials kits for Vaitupu, to replace houses destroyed by Hurricane Ofa in February 1990, produce a 60.3m² aluminium roof area on a very strong structure, without walls or floor supplied. The Director of Works said that the materials cost about \$6,000 per house, possibly including transport as far as Funafuti.

Findings 18:

AFFORDABLE HOUSE MORTGAGE LOANS FOR A FAMILY WHICH COMMITS (for only 15 years) ONLY 20% OF ONLY ONE 1992-LEVEL, CIVIL SERVICE SALARY, TO REPAY A GOVERNMENT INSURED & GUARANTEED HOUSING LOAN OVER 15 YEARS AT 11.5% p.a.

Assume: (1) A Civil Servant who has, or can acquire, the right to use an appropriately located land plot for a house, either through kaitasi (family) allocation, or by exchange, or by lease; (2) A Civil Servant and his or her family needing and wishing to supplement their own immediately available savings and resources of cash, building materials, labour and skills, in order to finance a house on that plot of land; (3) A Civil Servant & family who are able and willing to commit for only 15 years, a sum equivalent to only 20% of only one Civil Servant's current 1992-level salary, to repay an immediate house loan, with which to build a new house or to buy, extend or improve an existing house; (4) A Government able and willing to subsidise and assist the Civil Servant by insuring and/or guaranteeing repayment of a housing loan in the event of the death or default of the Civil Servant borrower and his family; (5) A Civil Servant and family who expect to be able, over future years, to maintain, extend, improve, maintain and repair their own house; **then:**

	(a) 1992 Civil Service Salary Scale (before tax) mid ranges	(b) 1993-2007 commitment of 20% of 1992 level salary	(c) 1993 house loan repaid over 15 years @ 11.5% p.a.
	\$ per annum (monthly amounts x 12)		\$ capital sum (received up front)
Levels:			(c) = (b) x 7.001
1.	11,418	2,284	15,990
2.	10,896	2,179	15,255
3.	10,260	2,052	14,366
4.	8,964	1,793	12,553
5.	8,046	1,609	11,264
6.	6,930	1,386	9,703
7.	5,952	1,190	8,331
8.	5,094	1,019	7,134
9.	4,074	815	5,706
10.	2,932	586	4,103

Note that if the commitment is increased then the capital loan which can be financed will also increase. If there are 2 or more Civil Servants in one family, they could pool their commitments, & borrow larger sums for larger, or more costly, houses.

Note also that 20% of gross salary will be a higher percentage of net salary after tax. Note also that if repayments are made monthly or fortnightly, the capital loan will be larger, or the term shorter, than is indicated on this Table.

Findings 19:

AFFORDABLE COSTS OF HOUSING WHICH IS TO BE FINANCED, BUILT, OWNED, MANAGED, INSURED, MAINTAINED, REPAIRED &/OR REPLACED BY GOVERNMENT, & rented at (1) 1992 Civil Service subsidised house & plot rentals; or (2) economic rents of 20% of salary before tax

The rent received, for a housing unit on land, is needed to support & make possible: (a) land rent; (b) costs of "renting" & repaying the capital cost of building, fixtures, fittings & equipment, over the useful life of the building, etc; (c) insurance against, or risk of, loss; plus costs of management, administration, lettings, rent collection, vacancies, etc; & (d) repairs & maintenance of building, fixtures, fittings & equipment; or if none is done, an annual allowance for postponed costs or accelerated depreciation, & a shorter useful life.

Land rent: On Fongafale Islet, the Government currently leases land at subsistence yield value, currently set at \$120 per gross acre per annum. In residential areas, it achieves an average of about 4.5 actual house plots per gross acre. The Government's cost, therefore, for the raw land is about an average of \$27 per average house plot per annum. It would appear reasonable to allow about 5% of stated house & plot rentals for raw land rent.

Capital rent & useful building life: The Government of Tuvalu has a "rent" or "opportunity cost" of capital of about 5% per annum in real terms. This is based on the best alternative use of funds, which is investment in the Tuvalu Trust Fund. In tropical Tuvalu, housing which is in conventional low-cost "Australian" style, which is rented, & is maintained through the Public Works Division, may be assumed to have a useful life of no more than 25 years before it would need to be recapitalised & replaced.

Insurance, risk, vacancies, management, administration; & repairs & maintenance of land, building, fixtures, fittings & equipment: This depends very much on the design & technology of the building, fixtures, fittings & equipment. Transplanted "low cost" Australian-type houses can have electric pumps & fans; water tanks, full plumbing, showers, taps, flush toilets, enclosed bathrooms, septic tanks; enclosed kitchens, refrigerators, stoves; wall boards, glass louvres, etc. It would appear not to be reasonable to allow anything less than a bare minimum of 15% of rent levied, as a contribution to insurance, risk, management, administration, repairs & maintenance, in the case of such types of Government rented & maintained houses in tropical Tuvalu.

Thus it would seem reasonable to allow about 20% of stated house & plot rentals for raw land rent, insurance, risk, management, administration, vacancies, repairs & maintenance, etc., of transplanted "low cost" Australian-type housing in Tuvalu which is rented to employees & maintained through the Government.

Up to about 80% of stated rent is available to finance the capital cost of building, fixtures, fittings & equipment, & to replace or renew all of those at the end of 25 years.

At an interest cost equivalent to about 5%, the Government can afford, in economic terms, to provide a housing unit with fixtures, fittings & equipment, costing 80% of stated annual rent x 14.094.

1. AFFORDABLE HOUSE COSTS AT 1992 SUBSIDISED RENTS OF BETWEEN 7% & 13% OF SALARY BEFORE TAX

(a) 1992 Civil Service Salary Scale (before tax) mid ranges		(b) 1992 House Grade & subsidised house & plot rental inc. maintenance		(c) Affordable cost of house, & replacement every 25 years, at opportunity cost of 5% p.a.
\$ per annum (monthly amounts x 12)				\$ capital sum (c) = 80% rent x 14.094
Levels:	Rent:	80%		
1. 11,418	B: 1,322	1,057.60		14,906
2. 10,896	B: 1,322	1,057.60		14,906
3. 10,260	B: 1,322	1,057.60		14,906
4. 8,964	C: 801	640.80		9,031
5. 8,046	C: 801	640.80		9,031
6. 6,930	SD: 612	489.60		6,900
7. 5,952	D: 576	460.80		6,495
8. 5,094	E: 360	288.00		4,054
9. 4,074	E: 360	288.00		4,054
10. 2,932	E: 360	288.00		4,054

2. AFFORDABLE HOUSE COSTS AT RENTS OF 20% OF SALARY

(a) 1992 Civil Service Salary Scale (before tax) mid ranges		(b) If Rents at 20% of salary		(c) Affordable cost of house, & replacement every 25 years, at opportunity cost of 5% p.a.
\$ per annum (monthly amounts x 12)				\$ capital sum (c) = 80% rent x 14.094
Levels:	Rent:	80%		
1. 11,418	2,284	1,827		25,752
2. 10,896	2,179	1,743		24,571
3. 10,260	2,052	1,642		23,137
4. 8,964	1,793	1,434		20,214
5. 8,046	1,609	1,287		18,144
6. 6,930	1,386	1,109		15,627
7. 5,952	1,190	952		13,422
8. 5,094	1,019	815		11,487
9. 4,074	815	652		9,187
10. 2,932	586	469		6,612

Findings 20:**THE GOVERNMENT'S 1991 FINDINGS ON TUVALU'S ENVIRONMENT, & ON PRIORITIES FOR ACTION TO PLAN & CONTROL URBANISATION & CENTRALISATION**

During 1991, the Government's National Development Strategy Committee (NDSC) acted as the Tuvalu National Task Force to prepare the Government's Report on the condition of Tuvalu's environment. This Report was submitted during 1992 to the United Nations World Conference on Environment & Development (UNCED) in Rio de Janeiro.

The NDSC is chaired by the Prime Minister, & comprises The Secretary to Government (in the office of the Prime Minister), & the Permanent Secretary of each of the Ministries. There are, currently, 6 Ministries.

The Government's Report was prepared during 1991, & was endorsed, adopted & published by the Office of the Prime Minister in January 1992.

The Report comprises a total of 156 pages which document:

- I. Developmental trends & environmental impacts:
 1. Natural resource endowment;
 2. Patterns of economic growth;
 3. Demographic trends;
 4. Constraints to the sustainable use of resources & to sustainable development;
- II. Responses & priorities for promoting sustainable development:
 5. Responses to environment/development issues; &
 6. Priorities for further action.

together with 8 tables & 6 appendices containing additional data.

The Report was published before the results of the November 1991 Census became available. The Report assumed that the population of Funafuti Atoll was only 3,000, or 33% of the national population. The November 1991 Census revealed an actual de facto Funafuti population of 3,839 or 42.5% of national de facto population.

The Prime Minister states "Through this National Report, the Government & people of Tuvalu express their strongest support for ... the promotion of environmentally & culturally sustainable development, globally, regionally & in the atoll country of Tuvalu ... we also express our hopes that the deliberations of UNCED will ... foster a return to more sustainable lifestyles that will ensure that future generations will be able to live out of the same resources that we currently have at our disposal."

The Report reiterates the Governor General's May 1991 "Speech from the Throne" which stated that "my government will seek the assistance of its

development partners ... in monitoring domestic activities & minimising the adverse effects of growth & development on the environment ... The vital requirement to safeguard the natural environment, while improving the economic productivity of the nation's resources, implies that environmental considerations should be more effectively integrated into the development & planning process."

Some examples of the Government's findings, & priorities for action, relevant to housing policy, & to associated land & infrastructure issues, are quoted below.

A few brief quotes from the 13 page Executive Summary:

p.xix: **The main set of issues in Tuvalu is "the high population density & growth rate, particularly on Funafuti, & its adverse impact on scarce terrestrial (*land-based*) & marine resources & the environment ... this will require strengthening of national legal, institutional & educational capabilities ... in environmental protection & management ..."**

p.xx: **"Coastal erosion: ... loss up to an average of 1 metre a year ... a thus far unsuccessful coastal protection programme involving the use of (*small*) cement blocks which have been displaced by waves as small as 1 metre ... Inadequate supply of local fill material, the high cost of imported cement & other materials ...**

"High population densities & rapid urbanisation, particularly in overcrowded Funafuti, have led to problems of: (a) landlessness, competition for land & the appearance of shanty settlements; (b) overfishing of reefs & lagoons; (c) deforestation & over-exploitation of terrestrial (*land-based*) resources; (d) breakdown of traditional food & subsistence production systems & knowledge, & associated increasing economic dependency, & incidence of malnutrition, & nutrition-related non-communicable diseases, such as heart disease, stroke & diabetes; (e) water scarcity & groundwater depletion & pollution; (f) sewage & waste disposal; & (g) increasing energy dependency."

p.xxi: **"... de-forestation & the associated scarcity of many ... important plant species. ... the removal of mangroves for fuelwood. ... endangerment of native tree species due to an over-emphasis on coconut mono-culture ... leading to coastal erosion & soil deterioration."**

"Breakdown of the traditional food & subsistence production system: Infant malnutrition; iron deficiency anaemia; obesity & nutrition-related non-communicable diseases such as heart disease, stroke & diabetes among adults, are increasingly serious health problems in Tuvalu. The main causal factor is a shift from a traditional diet to a diet of imported foods which are high in sugar, salt, alcohol & animal fat; & low in vitamins, minerals & fibre. This shift is due in part to the breakdown in the traditional food system & a change to a sedentary lifestyle, particularly on (Fongafale) Funafuti".

p.xxiii: **"the over-riding concern will continue to be issues arising from over-population & the impact of urbanisation on limited terrestrial & near-shore fishery resources, particularly on Funafuti. Related to this is the accelerating break-down of the traditional subsistence production system, which has, for hundreds of generations, given Tuvalu's people resilience & protection against natural & economic factors beyond their control. The promotion of culturally**

acceptable birth control measures is of the highest priority, followed closely by the need for water supply & waste disposal improvement, & the promotion of local food production & consumption to address serious environmental-health & nutrition-related problems".

p.xxiv: "Government emphasis on **sustainable production systems** will move ... towards more **traditional agro-forestry** systems which incorporate a range of tree crops, long & short term ground crops & other plants of economic, cultural & ecological importance. **The promotion of appropriate food & fuel species, particularly on Funafuti, is of high priority**".

p.xxv: "The overall aim is to achieve the **optimum balance** between modern economic development & cash employment ... & the protection of our traditional subsistence base".

A few brief quotes from the Report:

p.5 "The atoll soils of Tuvalu are among the most infertile in the world. They are young, shallow, alkaline, coarse textured & have carbonatic mineralogy ... Fertility is, thus, highly dependent on organic matter for the concentration & recycling of plant nutrients to a lower soil pH, & for soil water retention in the excessively well-drained soils".

p.10: "giant swamp taro or pulaka ... pits have been excavated to the level of the freshwater lens, through the limestone bedrock to depths of 1.5 to over 4 metres. Due to increasing salinity & the declining importance of pulaka relative to copra production (in the past), cash employment and imported food, a large proportion of the pits on some islands has been abandoned."

"The most important functions (of trees & other vegetation & flora) include the provisions of shade & animal & plant habitats, protection from wind, erosion, flood & saltwater incursion, land stabilisation, protection from the desiccating effects of salt spray, soil improvement & mulching".

"Shade is important to humans, plants & animals, especially in highly reflective low-lying coral island & lagoonal environments, & in villages & urban areas. As populations increase, shade & the role that trees & coastal plants play as habitats for (*humans* &) for other important animal & plant species will become more important. Of particular importance are mangrove ecosystems".

p.11: "Species commonly used for living fences or hedging include *Clerodendrum interme*, *Cocos nucifera*, *Ficus tinctoria*, *Hibiscus tiliaceus* & *Premna serratifolia*".

p.12: "many of the current generation, schooled in the modern education system & living in the cash economy, often know few of the traditional uses of plants ... a ... '**devegetation of the mind**' ... which has undoubtedly contributed to the degradation of the ... vegetation of Tuvalu".

"the abandonment (of traditional food & beverage crops) for imported foods such as sugar, white rice & flour, cabin biscuits, noodles, canned fish, softdrinks, alcohol & tea, has led to dangerous levels of food dependence & **some of the highest, or**

most rapidly increasing, incidences in the world of vitamin & mineral deficiency & nutrition-related diseases. Diseases such as iron-deficiency-induced night blindness, diabetes, cardiovascular disease, hypertension & stroke, gout & hyperuricaemia, some forms of cancer & dental disease, which were rarely encountered in the past, are now serious causes of morbidity & mortality in Tuvalu & among other atoll populations".

"There is still a need for planners & national development plans in Tuvalu to place a **high priority on vegetation protection** as a basis for sustainable development".

p.27: "Between 1984 & 1988, imports of food, beverage & tobacco increased by 68%.

p.33: The following was written just before November 1991 Census when it was thought that the population of Funafuti (including Fongafale Islet) was only 3,000. The Census revealed a population of 3,839, or 28% more than the then estimated population & population density for Funafuti & Fongafale.

"the future for sustainable development in Tuvalu does not look good. Projections based on even medium assumptions indicate that **current demographic trends will very soon lead to disastrous crude population densities** on the generally marginal land of Tuvalu. The 'nutritional' densities (the average number of persons per unit of arable land) are certainly significantly higher than these crude densities. **The continuation of current population growth rates will soon result in densities which are impossible to support**, not only in urban areas, but also in many of the rural outer islands".

"There continues to be considerable migration from outer islands to urban Funafuti ... There are currently about 1,000 (*the 1991 Census later reported 735 people including all family members*) Tuvaluan contract workers in Nauru ... With the projected cessation of mining operation in Nauru near the turn of the century ... most can be expected to return to Funafuti or their (other) home islands".

p.38: "the use of inorganic (artificial) fertilisers is ineffective in Tuvalu soils, due to high pH & carbonate content". (*ie. only organic vegetable, plant & animal residues are effective fertilisers in Tuvalu*).

p.43: "A rapidly increasing number of the urban-born or urbanised, & some urban or overseas-educated leaders, have lost the knowledge of & respect for the environment that their ancestors had. Their modern education "teaches" them economics, accounting, administration, politics, history & even modern agriculture & fishing ... the tools of western development & modernisation, but little about their traditional resource-use systems. **Such an orientation will continue to induce widespread environmental blindness which will foster an adherence to existing, environmentally-disruptive development alternatives".**

p.45: "there are signs of increasing incidences, & some potential for an outbreak, of Sexually Transmitted Diseases (STD) in urban Funafuti".

p.49: "Tuvalu's petroleum imports (alone) have exceeded the value of (all) exports over the past decade".

"Fuelwood ... is in short supply for urban households in the densely populated area of Funafuti, where ... partly due to the increasing cost of kerosene ... it has been estimated (*by the Pacific Energy Development Programme, in Suva, following household surveys in 1990*) the biomass resource may be exhausted ...".

p.51: "agro-de-forestation, in the forms of both declining tree planting & the elimination of trees from agricultural & urban areas ... is particularly serious on atolls ... where the main agricultural & food crops are trees, & where agricultural areas & **houseyard gardens** serve as the few remaining reserves where endangered plant varieties can be protected".

"Only recently ... has the Tuvalu government begun to acknowledge that 20 years of institutionalised coconut replanting & rehabilitation have led to serious "agro-deforestation" & the **gradual elimination of a wide range of ecologically & culturally important tree species, all traditionally components of the sustainable Tuvaluan integrated agricultural system**".

The Tuvalu Report for UNCED, in its Appendix I, indicates that 6 out of 26 widespread Pacific Island shrubs, & 52 out of 62 widespread Pacific trees, have uses in "**General Construction**". One shrub & 3 trees can be used for "**Thatching & Roofing**". One herb, one shrub & 5 types of trees can be used for "**Living Fences & Hedges**". Appendix II of the Report for the UNCED, on page 109, lists the botanical & Tuvaluan names of 28 trees & plant species found in Tuvalu, by the numbers of different uses they can be put to.

p.52: "De-forestation, the widespread practice of burning organic debris, & the decline in traditional intensive mulching systems, have led to soil deterioration in some areas of Tuvalu".

p.53: "Rapid urbanisation, rural-to-urban migration, & increasing centralisation of employment opportunities, social services, infrastructure & administration are major problems in Tuvalu ..."

p.54: "The '**tropicalisation**' or '**atollisation**' of mid-latitude, Continental technologies is often inappropriate". (*The J.S. Hill & other imported housing styles, are examples of this*).

p.55: "technical change is often implemented before the long-term environmental & social implications are fully understood. Such considerations are critical in the fragile atoll environment ..." (*The 1992 un-maintainable temporary bituminising of Fongafale's ungraded coral road beds was one recent example. The building of tightly sealed, unventilated, low pitched, aluminium roofed, walled, "solar oven houses" is another current example*).

"Although not widespread, signs of social disintegration are increasingly common in Tuvalu, especially in urban areas. The extended family system & wider kin-based, traditional 'social security' systems are weakening, with nuclear, often broken, families becoming increasingly common ... crimes ... are increasingly widespread in Funafuti.

Much of this has been associated with increasing use of alcohol, & drunkenness ...

It is also correlated with increasing ... traffic accidents". (*The proliferation of motor vehicles, including unnecessary buses & illegally imported motor bikes over 150 cc engine size, is causing increased economic, environmental & social stress.*).

p.58: "current models of development are not sustainable in ecological & cultural terms ... (*Traditionally*), scarce atoll resources were treated NOT as income to be spent but as capital to be cared for & preserved as the basis for future generations' subsistence affluence."

"Today's development agendas seem to be taking the atolls further adrift towards increasing dependency, social breakdown, & ecological ruin. The critical constraint is whether the rapidly emerging Pacific atoll 'managerial elite' (politicians, policy makers, community leaders, educators & agricultural & marine scientists) at the national & regional levels will selectively foster the conservation, modification & adoption of those traditional or existing strategies which seem to have relevance today, along with appropriate introduced or locally developed new strategies which could provide the appropriate foundation for sustainable atoll development & a better modern life for our people".

THE 18 IMMEDIATE "PRIORITIES FOR FURTHER ACTION":

1. Make the strengthening of environmental management infrastructure (*including land use planning*) a priority;
2. Establish an autonomous, cross-sectoral environmental ministry, unit, or board and an associated environmental impact assessment capability;
3. Incorporate environmental impact assessment procedures in all development strategies/initiatives as an integral component of the planning process;
4. Draft and strengthen appropriate environmental legislation and enforcement procedures;
5. Strengthen both formal and public environmental education, including the increase of local input and traditional knowledge, as a basis for sustainable development;
6. Strengthen the national research capability to assess the national resource base/environment and the impact of development on it, and to compile information on traditional resource-use systems and environmental knowledge;
7. Make training in environmental management a priority in manpower planning;
8. Establish/strengthen a system of appropriate terrestrial and marine parks, wildlife reserves and conservation areas, which takes into account both the nature of the resources and their subsistence importance;

9. **Implement land reclamation, seawall construction/stabilisation and coastal reforestation schemes (including the reclamation of the Borrow Pits);**
10. **Strengthen family planning and population control programmes;**
11. **Strengthen the traditional subsistence production system, particularly the terrestrial (*land based*) and marine food production system, in concert with, rather than in conflict with, export-oriented development;**
12. **Establish germ plasm (*or tissue culture*) collections of, or nurseries for, endangered or economically and culturally important wild and domesticated plant species;**
13. **Shift commercial fisheries emphasis to under-exploited species and ecosystems (eg. pelagic and reef-slope areas), maricultural production, or to appropriate introduced species (eg. trochus, giant clams, pearl oysters, eucheuma seaweed, etc);**
14. **Make decentralisation a priority, including the strengthening of social services and infrastructure in rural outer island areas;**
15. **Encourage appropriate water conservation policies and water collection and desalination technologies;**
16. **Promote soil improvement technologies, including traditional mulching and fertilisation practices;**
17. **Promote renewable energy alternatives, such as solar (& *human?*) power, in an effort to reduce increasing dependence on imported fossil fuels; &**
18. **Adopt appropriate strategies for waste disposal including the reduction of waste creation, & appropriate disposal or recycling strategies."**

	<i>1992 - 1994 Economic Framework</i>	<i>1991 Census: and/or 1984 Cadastral Survey</i>
<i>Tuvalu land area:</i>	<i>24.4 sq.km</i>	<i>23.96 sq.km</i>
<i>Population per sq. km:</i>		
<i>all Tuvalu:</i>	<i>378</i>	<i>377</i>
<i>Funafuti Atoll:</i>	<i>1,454</i>	<i>1,627</i>
<i>Fongafale Islet:</i>	<i>-</i>	<i>2,340</i>

The 1992-94 Economic Framework and Development Strategy does not mention any population projections, or appear to consider issues of over-development on Fongafale Islet.

"Chapter 4: Review of National Development Plan IV (1988-91)"

"an increase in the ranks of the unemployed and underemployed was detected during the period"

"Housing (1988-91)"

"Considerable progress was made in **Funafuti** as far as private home improvement was concerned. Progress was slower on the OIs and was further complicated, particularly on Vaitupu, on account of Cyclone Ofa. Construction of government housing lagged significantly behind demand, only the pilot scheme on **Funafuti** and housing for the Tuvalu Maritime School were completed. Both were financed by Australia. **The follow-up programme to construct 55 new houses was not executed because of land scarcity and the absence of a housing policy. A review of the general housing situation was conducted by AIDAB. The recommendations of that study will form the basis of a housing policy to be delineated in the medium term.** Also during the plan period, the economic value of government owned houses was established and rentals charged accordingly. This should provide GOT with adequate resources to maintain its capital stock."

"Transport (1988-91)"

"This sector continues to be plagued by high costs, inadequate facilities, irregular services, and a shortage of manpower to design policies and manage programmes. Some initial gains were achieved by increasing the number of shipping services to Tuvalu to three in 1989. This quickly declined to one only ship - the Forum Micronesia - which has called monthly since 1990. The fall off in the number of ships reflects insufficient cargo load to justify additional calls.

"Internal shipping improved significantly during the Plan period with the delivery of the Nivaga II in 1988. The new vessel, financed by UK aid, considerably expanded cargo and passenger capacity. Measures were effected to reduce the level of GOT subsidy through the introduction of subsidised and non-subsidised (economic) fares.

The cost of subsidising the Nivaga II operations, to both GOT and UK, still remains high. Consequently, additional revenues have been earned by increasing the number of charters to neighbouring countries." (*In late 1992, inter-island freight rate increases of 50% or 35% were being considered.*)

"Road improvement on Funafuti was recently completed with assistance from the United States Army Corps of Engineers. A number of motor vehicles were supplied by various donors, most notably Japan and Korea.

"Communications (1988-91)

"The most transparent and outstanding success of NDP IV was the 1990 installation of a satellite earth station on Funafuti. The earth station represents a major step forward in reducing the country's isolation from the rest of the world. Initially, two international lines were available but the number has since been expanded to four. This development gave rise to a proliferation of facsimile machines on Funafuti, thereby speeding-up and increasing the volume of overseas information exchange. .

"Water and Sanitation (1988-91)

"The main tasks of the water and sanitation sector during the plan period were the provision of at least **50 litres of water per day to each person within Tuvalu**. Related aims included the establishment of mechanisms for testing to ensure safety, supply of materials for the installation of proper domestic sanitation facilities for those requiring the service, and keeping waste disposal within safe environmental and health standards. Significant progress in these areas did not begin until 1991; thus, a number of the projects will be carried over into the medium-term. The reasons for this low level of performance are numerous, but the main reasons were funding delays, difficulty in obtaining resources to finance the sanitation components, poor coordination between the various agencies responsible for the sector, and insufficient priority given to various aspects of the project. The importance of these projects was underscored by the cholera outbreak in 1990.

"As regards increased water storage, this project commenced early in 1991 under UNDP assistance. The project met with further delays because the free-labour component built into the project was not forthcoming on many islands, **particularly Funafuti**. The public cistern on Funafuti, water tanks for each community maneapa, and additional storage for Government houses on **Funafuti**, were all completed as planned. Financial and technical resources for these projects were provided by Norway and USAID.

"The second programme, involving the rehabilitation and maintenance of water cisterns and catchments, remains ongoing. The programme also included training for plumbers. . . .

"The sanitation programme achieved a poor success rate during the plan period. Very few of the new water sealed latrines were provided . . . some latrines were constructed on Vaitupu and Niutao. Education programmes have been implemented but little heed was paid to the advice given. Under the Water Quality Control project simple bacteriological equipment was received in February 1990. The training in testing of water samples on a regular basis began in 1991 and is ongoing.

"The programme for refuse disposal was directed mainly at Funafuti. Refuse collection and disposal on Funafuti was the subject of a proposed aid project which, unfortunately, ran into difficulties and was never fully implemented. One aspect of the project, the installation of an incinerator at Princess Margaret Hospital, was carried out in 1991. As a result of the former, there are now considerable problems on Funafuti associated with inadequate and unsafe refuse collection and disposal practices. Although the public education programme envisaged under the Plan were conducted, the lack of facilities to reinforce positive action made that effort almost worthless. This programme, broadened to include OIs, is an important element of the medium-term strategy.

"Energy (1988-91)

". . . While some measure of success was recorded in improving the reliability of and access to electricity on Funafuti, electrification of the OIs as well as a number of other programmes were not implemented . . .

"In the diesel electric sector, half of the projects were executed. Among these was the extension of the Funafuti electricity supply, and the installation of street-lighting and Motufoua generators. The Motufoua generator project has been somewhat disappointing due to reliability problems. These problems were mainly the result of an inadequate provision of support services to maintain the system . . .

"The upgrading of internal electrical wiring within a number of government-owned residential and commercial buildings was not completed. Non-performance in this area was due to funding shortages and a delay by GOT in completing the housing review . . .

"In the renewable energy sector, the installation of solar photovoltaic (PV) refrigerators in OI medical dispensaries was finally completed in 1989 after overcoming numerous system design problems. The dispensary PV lighting project was also completed at this time. The long delayed LOME II PV upgrade project was successfully completed in 1991. This project included the installation of 160 PV panels, 165 batteries and 175 controllers to upgrade and/or replace the original 150 EEC-funded household lighting kits.

"Land Management, Environment and Conservation (1988-91)

"The overall objectives within this broad area were to maximise land-use development without affecting existing land ownership patterns; coastal protection; land reclamation; and the protection of the environment from pollution and over exploitation.

"The land development programme faced serious resistance from owners. This was manifested mainly in disagreements over land boundaries. Much of this matter is still being resolved, some of it through litigation. The pilot borrow pit infill project did not take place and is now planned for implementation in 1992.

"Administration (1988-91)

" . . . The programme's principal achievement was the enhancement in the capacity of PWD to fulfil its mandate. This is reflected in the construction of a new workshop, funded by New Zealand, and the localisation of PWD management. However, staffing constraints, both in quality and quantity, still inhibit PWD's ability to implement capital projects. Thus, PWD continues to rely heavily on expatriate staff. An important, though inadvertent, spin off of PWD's manpower constraints has been tendering by 4 private sector contractors for public works projects.

"Chapter 5: Medium Term Priorities, Policies & Strategies (1992-94)**"Environmental conservation and protection (1992-94)**

" Responsibility for environmental conservation straddles several ministries: Office of the Prime Minister (OPM) has responsibility for environmental issues in general (especially in connection with international fora and bodies); climate and weather remain the responsibility of the Meteorological Office of the Ministry of Labour, Works and Communications (MLWC); coastal conservation falls within PWD; and solid and water waste management which is covered by a number of bodies.

" . . . assistance will be sought from development partners, including Non-Government Organisations (NGOs), to assist in improving management of the domestic environment. Special emphasis will be given to monitoring and minimising the adverse effects of domestic activities and economic development on the environment. . . The government will also continue to avail itself of all training, information and technical opportunities from these sources. . . Chief among these will be the development of **a plan towards the realisation of the country's environmental goals. This will be undertaken under South Pacific Regional Environmental Programme (SPREP)/UNDP National Environmental Management Strategies (NEMS) Project.** The project, which covers seven small-island countries in the South Pacific, will run from mid-1991 to October 1993. The programmes set in place are expected to continue beyond the life of the project.

"In addition to the establishment of a taskforce to monitor the administration (this task is to be carried out by the NDSC), there are a number of prominent features to the project. They include the recruitment of an Environmental Officer within OPM for a contract of two years and the preparation of a status report on the domestic environment (*already completed, for UNCED ?*). Administrative, legislative and policy reviews will be undertaken with the formulation of an overall management strategy. A public awareness campaign on this strategy will be conducted with relevant in-country training taking place within Government and NGOs.

"The strategy will be broad in its scope, covering such issues and measures to monitor, control and eliminate or counteract if possible, domestic pollution, harmful fishing practices (especially to prevent over-fishing and the erosion of reefs), use of sand and gravel, **urbanisation** and population control. Monitoring of sea level rise, resulting from global warming, will also be a major part of the strategy. Substantial technical assistance will be provided by environmental experts of SPREP as well as consultants in law and institution building.

"Future development projects, especially major investments in infrastructure, must include environmental impact assessments. SPREP and other regional bodies will be asked to provide the expertise to perform the analysis. After suitable training, this will become the full time responsibility of the Environmental Officer. Additionally, the SPC sanitation project, considered elsewhere, is an important development in containing household pollution with more general attention being paid to industrial waste to eliminate contamination of ground water resources and lagoons. Recycling of aluminium cans and alternative use of plastic containers will be continued as well the encouragement of households to use organic waste for compost in their gardens.

"Another measure involves the infilling of the large excavated (borrow) pits in Funafuti with lagoon sediments. This strategy is dependent on the environmental diagnosis of the pilot project to be executed in early 1992. Currently, these pits are used indiscriminately for garbage disposal as a land reclamation measure. With increased land availability resulting from the exercise, more suitable space for garbage disposal sites should become available. In addition the second phase of the coastal projection project, funded by EEC and implemented by PWD, will continue in 1992.
..

"Human resource development (1992-94)

"Education and Training (1992-94)

"... Education is necessary to raise the productivity of the subsistence sector which occupies about seventy percent of the total human energy of Tuvalu;

"Improvement in human resource development must coincide with measures to improve the effective utilisation of human resources and creation of job opportunities.

"Vocational and Technical Training will include the broadening of the curriculum of the Tuvalu Maritime School (TMS) to include additional vocational and technical subjects other than maritime studies. It is intended that the underutilised staff will provide instruction in the fields of welding, electricity, engine maintenance, turning and machining, outboard maintenance, home economics and technical drawing. The full implementation of Technical Education Courses for Form IV graduates is expected in January 1995.

"The facilities needed for TMS include a buildings construction workshop, **at least three staff houses** and training equipment. In addition to projects for additional water storage and the upgrading of the catering unit which have already been developed, donor assistance is being sought for these other areas.

"Water and Sanitation (1992-94)

"The capacity to collect rain water via roof catchments will be expanded. This will involve the provision of individual household tanks to all families by 1994. Under the existing UNDP-funded water project, **some 1,458 household tanks are to be constructed** (*the 1991 Census recorded 1,452 occupied houses in all Tuvalu*). These will be built utilising materials, supplies and technical direction from GOT. Labour to construct the tanks will be provided by each household. In addition, all public

buildings which have roof water catchments, but no storage capacity, will be fitted with such (*storage tanks*).

"This later (public buildings) project will occur in two phases: The first phase will be executed within the current water supply project under which some 10 tanks are to be constructed. These are phased for completion by 1994. Funding for the second phase, which will run concurrently with the first, is to be secured shortly.

"Measures are to be undertaken to strengthen existing legislation. The existing building by-laws, which are already in-place on some islands and which explicitly specify for the provision of water and sanitation facilities, will be strictly enforced. Moreover, **Tuvalu's draft building code** (prepared through assistance from Australia), now under consideration by the Government's Pacific Building Standards Project Liaison Committees, will be implemented by 1994 . . .

"Energy (1992-94)

"Three principal sources of energy are consumed in Tuvalu: imported petroleum, solar, and biomass (wood, coconut husks/shells, other biomass residues). **Imported petroleum** accounts for **65%** of primary energy consumption; solar and indigenous biomass account for the remaining balance. With expanded access to diesel-generated electricity (**primarily on Funafuti**) and the introduction of solar power to OIs, approximately **50%** of Tuvalu households now have some form of electric lighting.

"Petroleum is supplied to Tuvalu by British Petroleum (BP). BP maintains its own onshore bulk storage and distribution facilities. . . In 1990, the cost of fuel imports totalled nearly A\$1 million, roughly **15%** of the total imports. The largest consumer of products remains the **transport** sector accounting for **42% of total consumption**, followed by households (30%), power generation (20%), agriculture and fisheries (5%), GOT (2%), and services (1%).

"In January 1992, BP notified GOT of its intention to dispose of its Tuvalu assets and withdraw operation from the country. At this time, BP also extended to GOT first right-of-refusal to assume control of the company's local assets. The BP pullout will be completed by year-end 1992.

"Diesel-generated electricity, **available only on Funafuti**, is supplied by the Tuvalu Electricity Corporation (TEC). (Small non-TEC diesel sets are operated at TMS and on some of the OIs). . .

"TEC's installed generating capacity is **600KW**, comprising four 150 KW generating units. 1991 energy production totalled 1,314 MWh (est.), up from 1,053 MWh in 1986.

Total energy sales in 1991 equalled 1,188 MWh, a 6% increase over 1990. Reflecting the size and role of the public sector, **GOT is the largest consumer of electricity, accounting for 36% of total consumption (1991)**. TEC is encountering a number of problems, effectively reducing operating efficiency. . .

"TEC will inevitably expand and considerable investment in capital equipment, and technical and manpower resources will be required in the future to meet demand and maintain the reliability of the system, on which **Funafuti** households, commercial enterprises and GOT administration, depend. . . .

". . . EEC is expected to fund the acquisition of an additional diesel generator and support equipment, increasing TEC's installed capacity to **750 KW**. Other development programmes include the **extension of the Funafuti electricity supply to the northern end of Fogafale**, system reinforcement, and the construction of a new administration building. . . .

". . . Tuvalu Solar Electric Co-operative Society (TSECS) operations are to be restructured to reflect three main areas of activity: system upgrades, expansion of the product line and consolidation of existing programmes. In the medium-term, TSECS will continue to upgrade installed lighting kits, as well as expanding them from 1-2 panel systems to 3-panel systems at no additional service fee to members. By mid-1992, as part of the ongoing upgrade programme, TSECS will have installed 125 new solar batteries in Outer Islands households. . .

"Presently, **Liquified Petroleum Gas (LPG)** is shipped from Fiji in **9-50 kg** cylinders. Since LPG payload is less than half the total weight being shipped, this (among other possible factors) results in a very high landed cost. It is primarily for this reason that LPG has not significantly penetrated the household cooking market, presently dominated by kerosene and biomass. During the plan period, GOT will move toward importing LPG to Tuvalu in larger, more economic, bulk or container parcels, with the objective of reducing costs. This will likely occur under the auspices of a newly created private gas company charged with the importation and distribution of LPG.

"Transportation (1992-94)

"It is the long-term intention of GOT to construct an airstrip capable of receiving jet aircraft on **Fogafale**, as well as introducing or upgrading Outer Islands airstrips. **The former is expected to increase air transport between Funafuti and the region, while simultaneously releasing land now utilised by the existing airstrip for new housing development, and recreational and commercial purposes.** For the medium-term, however, GOT will focus on improving existing airport facilities at **Funafuti** and augmenting internal services to the OIs provided by Nivaga II. . .

"Toward the construction of a **new international airport at the northern end of Fogafale**, the Government of France undertook a preliminary study in 1990 to determine the various requirements and indicative costing of the proposal. Based on their findings, a further study assessing the financial feasibility and environmental impact of the project is to be conducted in the medium-term. This study is especially relevant because construction will involve considerable land reclamation, the infilling of which will require the dredging of the lagoon. . . .

"Private sector development (1992-94)

"The **import reduction strategy** will actively promote the use of local goods and materials, both in production and consumption. This strategy will be carried out without resorting to quantitative import restrictions. . .

"GOT intends to address the shortage of office/factory space, which has inhibited import reduction. . . .

"The **Commercial Centre**, located within the **main market centre on Funafuti**, will be funded through donor assistance. Negotiations are currently underway with the EEC in this regard. The Centre will offer **over 1,650 square meters of commercial space**. GOT will own the facility for a minimum of three years before it is transferred to the private sector. During this period, the Centre will be managed by the Development Bank of Tuvalu (DBT), with tenants renting or leasing commercial space. An integral part of DBT's management responsibilities will be the provision of training in appropriate business practices for tenants. The Centre is also expected to be commercially viable, operating in a financially prudent manner.

"Already a number of businesses have been identified as potential tenants, most providing services which are not currently available in the country. Among them are a chemist, a photographic studio, and hair dressing parlour. The bulk of the other tenants will compete with services currently being provided, by the Fusi and Government. Their speciality will be the trading of goods such as stationery, handicrafts and gifts, electrical appliances, hardware and food items. Another group will operate businesses which complement existing services, through the opening of new branches away from the main government district of **Vaiaku**. Among this group are a post office, travel office and bank. The Centre will also house a conference facility, professional offices, possibly DBT's office, and the Chamber of Commerce.

"The second facility referred to above will be the construction of a **Mini-Industrial Zone**, complete with the necessary supporting infrastructure especially water and electricity. The Zone will consist of **six basic units with 50 square metres of floor space each**. Similar to the Commercial Centre, the industrial zone will be managed by DBT. Several potential clients have been identified, among them: a **manufacturer of low cost housing materials** and furniture made from local material and a rice milling and animal food producer. These two projects together with the construction of the complex have been put to donors for funding. Other possible projects which may be funded through DBT include food processing, brewing and garment manufacturing.

"Natural resources (1992-94)

"Approximately 80% of the population are involved in agriculture, mostly at the subsistence and semi-subsistence levels. The principal crop is **coconut** which covers about **70% of the cultivable land areas**. Breadfruit and banana are also common food crops. . . .

"Livestock production is slowly increasing. Pigs and chickens not only are being produced for feasting and other celebratory obligations, but increasingly to meet daily consumption needs. Commercial pig and poultry farming, especially on Funafuti, has emerged as an income generating activity, and quite a few farmers are engaged in these activities on a full time basis.

" . . . Agricultural development is constrained by the country's **land tenure system** whereby land is owned communally. **The land is often divided into plots too small to be productive** as facilities expand. The size of the land area of the islands and the land tenure system are obstacles to mechanisation or other large scale farming practices. Consequently, the land available for research is also restricted.

"Tuvalu is unlikely to become self-sufficient in agricultural production. **In attempting to satisfy at least 50% of the country's food needs** while simultaneously enhancing the income generating capacity of agriculture (particularly within OIs), GOT is implementing a comprehensive farming concept which will also attempt to develop exportable quantities of certain agricultural produce.

" . . . Encouragingly, chicken production in 1990 was estimated to be 24.4% higher than 1988 and 1989 production levels. To sustain this trend, especially for commercial flocks (broiler), plans are underway to set up a cooperative for broiler and egg producers on Funafuti. One of the aims of the cooperative is to take over the role of BuDAB in chicken feed importation and distribution. Under Canadian and US assistance, a **slaughter house** is to be constructed on Funafuti early in the medium-term. Live chicks for the broiler industry are primarily supplied from Fiji. . .

"The ubiquitous coconut tree remains the most productive and useful crop in Tuvalu providing food, shelter, energy, household implements and handicrafts. However, trees have not been replaced at a rate sufficient to maintain supply in step with domestic demand. Accordingly, **the coconut tree will continue to be the centre of the tree crop programme**. Through the nursery at Vaitupu, hybrid nuts will be planted on all OIs in demonstration plots of around one hectare. Plots have already been identified in Vaitupu and Nui. The programme will be executed over the next five to seven years, by which time it is hoped that the commercial viability of the programme will become known. Because of marketing difficulties experienced in recent years with copra, the goal of the replant programme is to satisfy domestic demand only. **Consideration is also being given to developing alternative by-products from the nut.**

"Despite several efforts to market agricultural produce both internally and for export, these programmes have met with little success due primarily to the lack of transport, storage and packing facilities. Another difficulty has been non- or late-payment to farmers for produce sold. **The consequence of these bottlenecks has been a growing tendency amongst farmers to distribute their produce through family and other island connections.**

The Agriculture Department intends to streamline this area beginning with the domestic market in Funafuti, which offers the best possibilities for the sale of agricultural produce.

Findings 22:**THE DRAFT NATIONAL WATER & SANITATION PLAN, 1993 - 2002:
IMPACTS ON HOUSING LOCATIONS, COSTS, DESIGNS &
TECHNOLOGIES.**

Mr Colin Reynolds, B.Eng., C.Eng., MICE, MIWEM, served for some years as a United Nations Volunteer in Tuvalu, acting as the Water and Sanitation Engineer in the Public Works Division of the Ministry of Labour, Works and Communications.

During August, 1992, Mr Reynolds was completing a draft National Water & Sanitation Plan for the years 1993 - 2002. The draft contains 16 chapters, of which the first 12 analyse the history and nature of the problems.

The recommendations are in Chapter 13 to 16 inclusive:

13. Legislation, institutional arrangements and training;
14. Design standards: population projections; water consumption; water storage; development of groundwater; water quality; sanitation; drainage; and refuse collection and disposal.
15. Proposed construction programme.
16. Conclusions.

All technical matters are covered in considerable technical detail, concerning their history and evolution in Tuvalu, on each Atoll and Island, and concerning recommended proposals.

Population Projections

The most recent population projections by Government appear to be those made in 1985 by the Government's then Planning and Statistics Division. These went to the year 2000. **These are the "A" figures in the table below.**

Mr Reynolds noted the preliminary figures emerging from the 1991 Census. These showed much larger population growth on Funafuti; and an actual fall in population on the 8 Outer Atolls and Islands.

He drafted 2 "Population Forecasts". One showed a continuation of 1979-91 trends: this has been refined using the latest available 1991 Census figures and is **shown as "B" in the table below.** The other is based on his "temporary assumption", or hope, that population on Funafuti Atoll (in effect, Fongafale Islet) will be kept **BELOW A MAXIMUM OF 4,805 by year 2002: this is shown as "C" in the table below.**

	Funafuti no.	%	Outer Islands no.	%	Tuvalu no. 100%
1979 Census actual:	2,120	29%	5,227	71%	7,347
1991 "A" projected in 1985:	3,484	38%	5,729	62%	9,213
Census actual:	3,839	43%	5,204	57%	9,043
2000 "A" projected in 1985:	4,585	42%	6,341	58%	10,926
"B" if at '79-'91 rates:	6,007	57%	4,564	43%	10,571
"C" assumed for Water and Sanitation Plan:	4,626	42%	6,300	58%	10,926
2002 "B" if at '79-'91 rates:	6,635	61%	4,309	39%	10,944
"C" assumed for Water & Sanitation Plan	4,805	42%	6,543	58%	11,348

The Government's Draft Water & Sanitation Plan only aspires to provide 50 litres of water per day for POPULATION GROWTH ON FUNAFUTI ATOLL OF ONLY 966 WATER-USING PEOPLE over the 11 years 1991 to 2002.

This is an average of less than 88 water-using people per year.

This includes tourists; visiting representatives of donors; visitors and migrants from Outer Islands; returnees from Nauru; returning sailors; and children born after November, 1991.

The latter will be the children of the 935 females on Funafuti at that date, who were between ages 10 and 39, and who will be, in 2002, between ages 21 and 50; plus the children of the 188 females aged 5 to 9 in 1991, who will be 16 to 21 in 2002; plus the children of in-migrants.

If new houses on Fongafale Islet continue to attract an average of 7.7 people per occupied house, the draft Water & Sanitation Plan will only aspire to provide for 11 new occupied houses per annum, with no increase in numbers of people in "collective" dwellings such as Boarding Schools, Training Institutions, hospitals, hotels, jail, hostels and the like.

The plan assumes that 382 new houses will be built in all Tuvalu between 1991 & 2002, to accommodate national population growth of 2,305 people, at 6.03 persons per new house.

It assumes that a maximum of 42%, or 160 new houses, will be built on Funafuti between 1991 & 2002, between 15 & 16 a year, if there is no increase in people in collective dwellings.

Water Use Allowances

The Draft Plan assumes that "a large proportion" of the drinking needs, of each human body in tropical Tuvalu, will actually be met by drinking fresh young coconut juice. (The Plan does not mention the high consumption, on Funafuti, of imported tinned and bottled soft drinks and beers). In addition to that, the Plan aspires to store and provide (except in unusually prolonged periods of drought) 50 litres of water per population unit per day, as follows:

Drinking, food preparation and cooking	: 10 litres
Dish washing and general cleaning	:10 litres
Laundry	: 10 litres
Personal bathing, by shower, basin or ladle	: 10 litres
Sanitation by flushing or pour-flush toilet	: 10 litres

The draft Plan notes that:

- gravity-fed, Australian type, showerheads discharge water at 3 to 4 or more litres per minute; thus a shower tap, left on for more than 3 minutes, can discharge more than one person's total daily bathing allowance;
- hand-basins of the European type contain 4 to 5 litres at a time;
- all taps, pipes and pipe-joints are potential sources of leakage and/or wastage;
- toilet flushing is notorious for wasting water; a single flush can use as much as 9 litres;
- where electric pumps work on demand through control by pressure switches, the rate of discharge is greater than with a normal pumped gravity fed system, so wasting even more water than ordinary gravity fed, piped, systems, particularly in showers.

The draft Plan notes that international experience in developing countries indicates that where house connections feed taps etc inside houses, **average use is between 100 and 150 litres per person per day, 2 or 3 times the Plan's allowance for Tuvalu.**

The Plan overlooks the possibility of reducing waste, as well as costs, by adopting South East Asian water use techniques.

The 50 litre per person per day target does not include water needs for: bus, truck, car or bike washing; garden watering; pig and poultry farming; or slaughtering and cleaning of fish, pigs and poultry.

Large buses, trucks, 4 wheel drives and other vehicles are proliferating on Fongafale Islet. The Government's **current Economic Framework proposed expansion of pig and poultry farming and the start up of a slaughterhouse.** There are also hopes of growing fresh vegetables, which would need watering.

Water Collection Catchment areas needed

To collect 1 cubic metre (1,000 litres) of rainwater, one needs the following areas of corrugated aluminium catchment:

3 square metres essential; 4 square metres desirable.

Water Storage in houses by households

The Government has already determined that, in the light of technical, absorptive and economic constraints, the following standards shall be set for Tuvalu. The current UNDP project aims to provide 1458 household tanks, one for every existing house in all Tuvalu, by end 1993. Thereafter the approx. \$1,000 cost per installed household tank will be part of the capital cost of each new house.

Each household and/or house should provide water storage capacity of:

- a) On the wetter, central and southern Atolls and Islands of **FUNAFUTI, NUI, VAITUPU, NUKUFETAU, NUKULAEALAE and NIULAKITA:**
1.5 cubic metres (1,500 litres) per person (50 litres per person per day x 30 days without rain): to collect this, a catchment area of 4.5 to 6 square metres per person is essential/desirable. **An average household of 6 people needs/desires a catchment (roof) of between 27 square metres (essential) to 36 square metres (desirable), on these 6 Atolls and Islands.**
- b) On less-wet, northern **NANUMEA, NANUMANGA and NIUTAO:**
2 cubic metres (2,000 litres) per person (50 litres per person per day x 40 days): to collect this, a catchment of 6 to 8 square metres per person is essential/desirable. **An average household of 6 people needs/desires a catchment (roof) of between 36 square metres (essential) and 48 square metres (desirable), if on Nanumea, Nanumanga or Niutao.**

Communal Water Storage

The draft Plan also provides additional storage in community tanks and cisterns filled by catchments of community buildings. These are to provide:

- 0.75 cubic metres (750 litres) per person, on Funafuti, Nukulaelae and Nulakita;
- 0.85 cubic metres (850 litres) per person on Nui, Vaitupu and Nukufetau; and
- 1.5 cubic metres (1,500 litres) per person on Nanumea, Nanumanga and Niutao.

There are special requirements for "collective" dwellings and for day-schools, offices, hospitals and for guests, visitors and so on, including livestock. Each brood sow requires 25 litres per day; each 100 laying hens 32 litres per day: plus 100% more for washing down i.e. potentially 50 litres and 64 litres respectively, as much or more than each human. Water needs for the proposed Fongafale slaughter house are "yet to be determined".

Drainage and Sanitation

As with water tanks, the costs of household drainage and sanitation are to be paid by the land or house developer, or householder, of each new house built after "early 1994".

There is no community drainage system, even for the narrow, permissive vehicle ways called roads. All drainage must soak away into the groundwater below the permeable coral sand.

The capital cost of a ladle-pour-flush Pit Latrine, topped by a pedestal toilet, but excluding any structure above it, is estimated at \$381, presumably including all overhead costs if done as a large scale aid project. If done by self-help, it would surely be less.

The capital cost of a household Septic Tank, apparently excluding toilet and bathroom costs, and excluding the costs of future collection and disposal of sludge, is estimated at \$3,150.

A ladle-pour-flush pit latrine is the standard proposed requirement. Only public, community and commercial buildings and some high cost housing and very high income households would be expected to provide Septic Tanks.

Solid & Toxic Waste Collection & Disposal

Tipping in land fills is the only feasible method of disposal. There are not yet any standards for separation, collection, or disposal. **This whole subject still awaits detailed attention. Meanwhile, most solid waste, including toxic waste such as old batteries and petroleum products, is fairly haphazardly collected and disposed of, mostly indiscriminately, in borrow pits.**

Conclusions (Chapter 16)

- "1 Within the next 10 years, the period of this Plan, if the actions detailed here are not carried out then the environment will deteriorate. Life is difficult enough without conditions being made worse.
- "2 **The crucial areas are those of the collection and disposal of liquid and solid wastes. As the population increases and living conditions alter, the time available for making the correct decisions lessens. With the exception of Funafuti, there is time. For Funafuti, time is running out and action is needed NOW.**
- "3 Water supply and storage have been considerably improved in the period 1980-83. The present policy of depending on roof catchment/storage systems is considered to be much better than relying on the exploitation of groundwater.
.."
- "4 **It should not be overlooked that the proposed consumption standards are minima. With the availability of water, it is very possible that consumption will rise with a corresponding need for more storage. At this time it is intended that such desires are privately financed.**

- "5 The recommendations . . . require adequate resources of finance for trained and motivated staff, materials, plant and works.

It is necessary that the Government and Councils decide if they wish the Plan to be implemented in this, or some modified, form.

- "6 Following receipt of the approvals from Government and Councils, steps can be taken to approach Aid Donors for funds to implement the Plan. . ."

IMPACTS ON HOUSING LOCATIONS, COSTS, DESIGNS & TECHNOLOGIES

(a) Locations

Current trends, reinforced (presumably unwittingly) by the 1992-94 Medium Term Economic Framework & Development Strategy, are for Outer Island populations to fall. **Each dollar invested or consumed on Fongafale, reinforces the psychological as well as the economic motivations for migration to the "Mainland" of Fongafale Islet.** People migrate to Fongafale Islet, where urbanisation grows fast, accelerated by the growth of the Civil Service and the cash economy, and by concentrated investment in continental-style urban infrastructure and lifestyles.

Thus, household occupancy on Outer Islands is falling. It appears that **a surplus of housing, and possibly also even of water storage**, could become apparent on many Outer Islands in the near future, if it has not yet already become apparent on some. The only Outer Island which still appears to be overpopulated, is Niutao (with 1.43 people per acre in 1991), but its population has fallen since 1979, and the Niutao community owns Niulakita, which can still absorb about another 25 people to give it a population of 100, or 1 person per acre.

Restricting Government / donor investment in water storage and housing on Fongafale Islet, as implied, either by accident or design, in the Government's draft Water and Sanitation Plan, would appear to be one effective policy helping to re-balance Tuvalu.

The danger is that different policies and strategies will contradict each other. A national land use, population distribution, technology and investment locational plan, policy and strategy is needed, as a basis for co-ordination of all policies, strategies and plans.

(b) Costs

The cost of a standard "low cost" house needs to include a sum of between \$1,280 and \$1,500 for a Water Tank and a Pit Latrine, in order to conform to the expectations of the Water and Sanitation Plan.

Extra household water storage and a Septic Tank, could increase that up to \$5,000.

These sums would take a significant proportion of the affordable house costs determined in Findings 17, 18 and 19 herein.

(c) House Designs & Technologies for storing and dispensing water.

It appears that the amounts of water which can affordably be stored for household consumption, are not unlimited. The standard of 50 litres per person, per day, or even more than that, does not permit water to be used in the same ways that water is used in households in industrialised continental cities which have enormous and enormously costly, regional dams and piped water reticulation systems.

Even industrialised continental cities are now finding that their water consumption levels per head are unsustainable, and are forcing people to pay more for, and thus use less, water.

The majority of the world's population, including many with standards of health and of living and qualities of life, equal to or higher than, those of Tuvalu, do not use the particular techniques and technologies that became popular and almost universal, in Australia during the prosperous years of that "lucky country".

Many hundreds of millions of people on islands within 10 degrees north and south of the Equator, particularly in South East Asia, prospered, and prosper still, without copying Australian ways of wasting water. Their personal standards of bodily freshness, hygiene, bathing, laundry, and of food preparation and cuisine, are among the highest in the world. Yet they achieve these standards without using showers, pipes, taps, electric pumps, high level header tanks, flush toilets or toilet paper.

It appears that the facts and the logic of water storage and conservation on Tuvalu point to the need for Tuvaluan solutions to Tuvaluan needs. Similar needs, over thousands of years, have produced model solutions for household water storage and use, and for the design of bathrooms and kitchens, which the Government and people of Tuvalu need now to study, and consider adapting for their own purposes.

The South East Asian technologies of placing all "wet areas" of bathrooms and kitchens at significantly lower and more open, ventilated floor levels than the "dry" areas of a house, and of storing water for 1 or more day's needs in floor to elbow level cisterns in kitchens, bathrooms and toilets, does away with any necessity for pumps, pipes and taps. Dispensing water for all needs by use of a lightweight ladle or dipper (1 litre), ensures total control of use, minimises waste, maximises conservation, and minimises both capital and recurrent costs.

Accidentally acquired Australian habits of water wastage have not conferred upon Australians any higher levels of culture or civilisation, cuisine or personal freshness and hygiene, than those developed by the peoples of South East Asia. Australians and Europeans who visit or, increasingly, live in countries like Indonesia, quickly learn to enjoy the tropical asian island "mandi", especially in well ventilated bathrooms and toilets without an outer wall, facing a screened small private garden.

Findings 23: THE 1990 PROPOSAL FOR A BUILDING CODE, AND A SEPARATE HOME BUILDING MANUAL

During the late 1980's a project team based in Suva, Fiji was funded by AIDAB to draft Building Standards for the Pacific Region. These are now being considered by the Tuvalu Government for legal adoption in Tuvalu.

There are, confusingly, 3 publications: a **Building Code**; a **Home Building Manual**; and a **Commentary**. They overlap one another and are very hard to understand. Their graphic design, editing, typographical errors and lack of pagination, make them very difficult to use, understand, and refer to. A well-designed, plain English, one-volume edition is needed.

Their best feature is their "Deemed to Satisfy Provisions". These would permit authorities to permit non-conventional building construction if that construction is "deemed" by some responsible or qualified person to be strong and safe enough to "satisfy" the technical "performance standard" specified in either the Code or the Manual. This would give opportunity for experiment.

The Home Building Manual limits itself to the most ordinary, basic, conventional Australian and New Zealand styles. For example, it only deals with Roof Pitches up to **25°** maximum, and Eaves of **900mm** overhang. For the rest, the Manual is silent.

The authors stress these limitations: "We have not been able to give the structural details for vernacular forms of construction. Some useful advice is available in this connection in 'DISASTER-RESISTANT CONSTRUCTION FOR TRADITIONAL BUSH HOUSES' by Solomon Islands architect Mr Charles Boyle, published (in 1988) by the Australian Overseas Disaster Response Organisation". AODRO's 1990 to 1993 papers on "DISASTER RESISTANT SAMOAN HOUSES" by engineer Barry Blake, are even better.

One example of the difficulties of understanding the Code and/or the Manual is the definition of the **wind speed** which buildings are to be designed to withstand: "A limit state basic wind speed of **60 m/s** to all areas. The equivalent basic wind speed for permissible stress methods of design is **40 m/s**. The terrain and topographic features in Tuvalu are such that the **design wind speed** corresponding to the basic wind speed, is **45 m/s** up to a height of **6 m**. When the simplified procedure of AS 1170 part 2 is followed, the value of the factor B_1 to be applied is **1.5**. The maps of Australia in the Standard are to be disregarded".

It seems that even if Tuvaluan home-builders and work people could obtain, study, understand and remember all the details of the separate, unpaginated books, and then build in strict accord with the Australian and New Zealand materials and techniques specified, their buildings would still not resist windspeeds or storm surges like those of Cyclone Bebe: up to **78 metres per second** windspeed; and storm surge up to **50 ft. (15 metres)** high.

Thus the Code/Manual, even if strictly followed, may not save any Australian type timber-framed building or house from a major cyclone like Bebe.

The Australian-New Zealand style specified by the Code and Manual, is the timber **"Balloon Frame"** style. This is a complex frame of hundreds of pieces of small-section, factory-milled, timber studs, plates, rafters, joists and braces. Each of these elements is supposed to be rigidly fixed and held down by some form of metal nails, bolts, steel hooks or straps, or gusset plates. Thousands of these are needed in a normal house. Most are of some kind of galvanised metal. The galvanising easily scratches during use. The metals underneath can and do corrode in Tuvalu. All of the factory-milled, graded, timber sections and elements, and all of the corrodible metal nails, bolts, rods, straps, and gusset plates have to be imported into Tuvalu: they have to be transported, stored, retailed and paid for in cash. Even if all this could ever all be done in strict accordance with the Code and Manual:

- * the houses would not resist really strong cyclones;
- * the houses would be hot, uncomfortable and inappropriate in the climate of Tuvalu: tightly sealed, low pitched, aluminium roofs are highly efficient solar ovens; and
- * the houses would force Tuvaluans to try to conform to house lifestyles evolved by different people in different climates, different cultures, different economies, different types of societies, with different infrastructures, different water supplies, support services and settlement patterns.

During 1992, close inspections were made of hundreds of houses, many still under construction, in Tuvalu. These were of three basic structural types:-

- (a) Indigenous Tuvaluan framing style of unmilled local heavy timber logs and branches, mostly fala (pandanus). Some of these now use reinforced cement-block columns, or reinforced concrete columns;
- (b) Australian/New Zealand imported timber "balloon frame" Building Code/Manual style;
- (c) Full reinforced concrete columns, beams, floors and roof frames.

The heavy structural log joints of **type (a)** are usually well forked, tied, tenoned, or pinned in traditional ways, or else well bolted down. They are felt to be relatively safe, or at least much safer, than balloon frame types being built.

The **lightweight balloon frames** usually start well with bottom plates bolted to bolts embedded in a concrete ground slab. As building time goes by, money and patience run lower, and roofs are held together by mere skew nailing. These are felt to be **unsafe**. Few bolts were seen. Not a single gusset plate was seen: they do not seem to be imported into Tuvalu.

The conclusion to be drawn is that the 1990 Building/Home Building Code/Manual by itself cannot be relied upon to solve any significant housing, or safety, or economic, or environmental, or cultural problems in Tuvalu. The 1990 to 1993 publications of AODRO are far more useful, and should be developed further in detail, for use on building sites.

Findings 24:
TUVALU'S MULTI-CULTURAL HERITAGES OF
LIFESTYLE & HOUSING DESIGNS & TECHNOLOGIES;
& TUVALU'S OPPORTUNITIES FOR CHOICE.

Findings 1 herein indicates why Tuvalu cannot simply copy the current land use, infrastructure or development styles of equatorial Kiribati, Nauru, Tokelau, Marshall, or even of other, non-equatorial, Pacific Islands.

Findings 6, 8, 9, 12, 13, 14, 17, 19, 20, 21 & 22 all summarise, or point to, factual evidence of the inappropriateness, for Tuvalu, of many policies, strategies, technologies and designs which other people, in other places, in other times, have carefully evolved to address their own particular needs. These ideas mostly come from temperate-climate, industrialised, continental-sized environments, economies and societies, mostly European or European-derived, such as the U.K., Australia, New Zealand and the U.S.A.

Findings 22 begins to indicate that practical ideas, for solving practical problems on Tuvalu today, may be sought and found in the Tuvaluan heritage from tropical island South East Asia. South East Asia, today, is proving the continuing practical effectiveness of the heritage that Tuvalu shares. It is a heritage of which Tuvaluans should be proud.

Tuvalu's South East Asian, Malayo-Polynesian, heritages

Scientists and scholars [Waterson (1991); Austin (1988); Bellwood (1985) & (1978); Blust (1980); Barnes (1977); & Pawley (1975)] have, only in recent years, finally discovered and demonstrated that the original heritages of genes, language, trees, fruits, tubers, house designs and technologies of Western Polynesians (including Tuvaluans), came from South East Asia. The great family of which Tuvaluans are members, sprang first (around 4,000 BC) from what today we call the South China mainland, across to Taiwan, and then through and across the scores of thousands of tropical islands between Tuvalu, Philippines, Indonesia, Malaysia, Vietnam, Thailand and Japan. They reached Tuvalu, from many directions, only during the last 500 to 2,000 years.

One simple and basic example of this shared family heritage, is that today's Tuvaluan language still uses a very large number of words which are the same as, or very similar to, words also still used today in the languages of Malaysia, Indonesia (including the local languages of Sumatra, Java, Bali & eastern Indonesia), the Philippines, the off-shore islands and atolls of northern Melanesia, and Micronesia.

Practical experience of the problems and opportunities of everyday life, on tropical islands throughout the Malayo-Polynesian region, has been gained by hundreds (possibly thousands) of millions of intelligent, observant and competent people for 100 to 200 generations. They have travelled, migrated, talked and shared ideas and skills.

Experience and experiment, over thousands of years throughout this Malayo Polynesian language family, have yielded much wisdom and skill in solving the domestic problems of everyday, everynight life, in tropical climates, on tropical

islands. Appropriate styles of comfortable living, in affordable houses, have been carefully and thoughtfully evolved by successive generations.

Scientists and scholars have only recently begun accurately to document comparisons between these styles, in **places which, during the recent Colonial period, tended to be cut off culturally from each other**, in separate British, Dutch, Spanish, Portuguese, American, French, German, Chinese, Japanese, Australian, New Zealand and other, "spheres of influence".

This may be why so few people today in Tuvalu seem to be aware of the close family resemblances between languages and house design styles throughout Western Polynesia and South East Asia.

Tuvalu's emerging coral reef islands and atolls have been settled and cultivated only comparatively recently; and mostly by individuals or very small groups who first came, often unintentionally, from islands such as Samoa, Tonga, Uvea, Tokelau, Fiji, Kiribati. Tuvalu has long had housing designs & technologies similar to those of Kiribati. But Tuvaluans appear to have had little or no knowledge of the South East Asian heritage that western Polynesia, Micronesia and the northern islands of Melanesia all share.

Traditionally, and still today, shipping and import costs over long oceanic distances to very small (non-commercial-scale) island markets are high and unaffordable for heavy, bulky things like staple foods and building materials. **Members of the Malayo-Polynesian language family have been solving this problem for thousands of years, in highly practical ways. They have shipped, imported, transplanted and cultivated, light-weight, low-bulk, genetic material, such as seeds, seedlings, germinating nuts, tubers, cuttings, shoots, eggs, chickens and piglets, as well as ideas, skills and people. They have fertilised and enlarged small, bare emerging islets, atolls and islands. They have cultivated their own staple foods and building materials, locally. They have designed and built their own styles of housing, to suit their own culture, environment and lifestyle. The oral, written, drawn and photographic history of Tuvalu records this process at work throughout Tuvalu over recent centuries.**

Learning from other people's mistakes

Polynesian history also records examples of Polynesians who have not acted wisely in their own best interests. **In the Central and Eastern Pacific (for example), there are at least a dozen islands where Polynesian communities over-exploited and destroyed their own resource base of trees, food and shelter materials; and so destroyed many (or all) of their own people.** These include Easter Island, Henderson Island and 11 other now-abandoned "mystery islands" [Diamond (1991); Perlin (1989); Bellwood (1988) and (1978); Steadman & Olsen (1985); Kirch (1984); Martin & Klein (1984); and Flenley (1979)].

The 1991 Report on Tuvalu's environment (see Findings 20) indicates **new and additional dangers** from over-reliance on inappropriate, excessive, unsustainable imports of industrialised foods and technologies.

LOnGO : traditional Tuvaluan wisdom, intelligence, skill in land use planning.

Tuvalu lies close to the geographic centre of this Malayo-Polynesian cultural region, between Sumatra and the Malay Peninsula on the west, and Easter Island on the east; and between Taiwan and Hawaii on the north, and New Zealand on the south.

The basic tropical island house design

The basic character of house design and technology, evolved by experience throughout this region, over thousands of years, has been shown by Waterson (and others) to be remarkably consistent. To the writer of this Report, it also seems to be a remarkably scientific and modern response to tropical island heat, humidity, corrosive salts, driving rain, wind, cyclones and earthquakes.

The basic characteristics are as follows:

- 1. Roofs tend to be steep-pitched (close to a median of 45 or 50 degrees) and to come down further, to lower eaves, than do the characteristic roofs of, say, Australian houses; roofs are bigger, more important and more visible, than are walls or other vertical screens.**
- 2. Roofs tend to be gabled, with ventilated roof slopes and ridge lines tilting up towards ventilated gable ends. This "saddleback" ridgeline helps natural air conditioning by convection. The topmost small triangle of the gable end is often open, or porous, and closable with shutters, or protected by an overhang.**
- 3. Roof structures tend to be held together, and tied and pinned down, by flexible, gale and earthquake resistant, joints of fibre bindings, hardwood (e.g. **ngie in Tuvalu**) tenons, pins, pegs, braces and ties. These joints move a little, or even "dance", in a gale or earthquake; but mostly because of that, they survive. Modern, industrialised, rigid, joints, fixings and materials, often made of easily scratchable, thinly galvanised metal, tend to corrode in sea spray islet air, or to crack, split, come apart and collapse under the sudden stress of a wind burst or earth tremor.**
- 4. Floors tend to be raised to a median height of about 1 metre above the ground, above nuisance pools, flash floods, small cyclonic storm surges, wind blown sand and leaves, dirt, mud, dirty feet and sandals, refuse and animals. Floors, roofs and walls all tend to encourage air flow: they tend to "breathe", to be porous. Floors tend to be of slats, raised on well anchored timber posts or piles.**
- 5. The use of timber for raised floors has been the norm, except in places when timber is very scarce, as in Central and Eastern Polynesia, where it is saved for major posts and roofs. Bali is a unique pocket of Asian mainland, ancient Hindu, influence, with raised stone or brick "bale" ("fale") platform floors, but also with slatted timber or bamboo, ventilated, sitting and sleeping platforms about 1 metre above that Asian-mainland style platform floor. **Tuvalu is at the centre of the floor-style shift: raised timber or other open slatted floors predominate west of Tuvalu; coral platforms predominate east of Tuvalu. Tuvalu has both types.****

6. **House interiors** are not made stuffy by partitioning into small European "rooms". Houses are open to cross ventilation. People select and change sleeping places as appropriate to the weather, the season, their age and current role in the family or household.
7. **Possessions are stored** in trunks, lidded boxes, cupboards, or on racks or shelves in eaves and roof spaces, or on mezzanine floor levels, or hung from rafters.
8. **Roof eaves often come down to within 1 metre of, or past, the floor platform level, often to within 1 metre of the ground**, thus protecting sitters, sleepers and their possessions, against wind-driven, near horizontal, heavy rain.
9. **Blinds (roll-up or fold-up), or other types of screens**, are used to close the low height spaces between eaves and floor, or eaves and ground, where this closure is desired, either to soften a harsh wind, or to achieve a period of personal privacy.
10. **Kitchens and bathrooms**, tend to be at lower floor levels, in separate, often linked, pavilions near the sleeping, sitting and other pavilions, arranged around a courtyard space. Thus ventilation is enhanced; smoke, smells, wastes and wetness are dealt with; and spaces created for vegetation, decoration, play, home occupations and large social gatherings and ceremonies.
11. **Living hedges, tree belts, coral rock walls, or woven screens** are created to protect settlements, courtyards and house pavilions from wind, wind driven rain, cyclonic storm surges, prying eyes, night crawlers and casual thieves.

This basic or "archetypal" Malayo-Polynesian tropical house form has a multitude of **minor variants**. These depend on such matters as:

- * **local proportions and characteristics of available materials** (timbers, bamboo, stone, rock, coral, grass or palm leaf thatch, corrugated zinc, iron, aluminium, clay bricks, coral lime, cement, reinforced concrete, etc);
- * **local micro-climate** (monsoonal, cyclonic, coastal, upland, etc);
- * **local geology** (volcanic, earthquake-prone, sunken mountain top island, coral reef island, etc); and
- * **local spiritual, religious, social, cultural and art forms and expressions; local concepts of status and prestige; and local fashions.**

But **physically**, the basic house form appears (to the writer of this Report) fundamentally to achieve **three very practical, modern, purposes**:

- * **This basic tropical house form is a natural, highly scientific and modern, "air conditioner" at all times, regardless of the movements of sun, cloud, rain or wind. It exploits that fundamental law of physics: warmer air rises up, and cooler air flows into the vacated lower space. This is called "convection". The tropical style house can create and maintain a gentle, continuous air flow at all times within the house.**

Human beings have been so created that their skins need "evapo-transpiration": **in the tropics, the human skin needs a continuous faint flow of air over it.** This seems to be well appreciated in Tuvalu, where people often change their sleeping place from night to night, or several times during the same night, in search of a gentle breeze, or at least some air movement; and where the European or Australian, or other temperate-climate, concept of the boxed-in "bedroom" is inappropriate, even if it is now often suffered in silence.

The low-pitched, sealed, aluminium roofed, walled Australian-style houses now being built in Tuvalu using Australian building methods, as detailed by the 1990 proposed Building Code, **are highly efficient and effective solar ovens.**

- * **This basic tropical house form is also a sensible shape for shelter and defence against heavy rain, strong wind, and wind-driven, near horizontal rain. In Tuvalu, wind-driven, near-horizontal rain, can come from almost any direction. The steep-sloping roof, coming down close to, or past, sleeping or sitting levels, protects horizontally, and deflects strong horizontal winds more easily and evenly than styles with low pitched roofs and high vertical walls with holes for windows. The use of roll-up or fold-up blinds and screens, between eaves and floors, or eaves and ground, or in gable ends, controls the degrees of ventilation and privacy as desired at any time.**
- * **A steep pitch has less critical up-lift characteristic in strong, or hurricane/cyclone, force winds. A 40 to 50 degree steep pitched, ridge vented, low-eaved, roof with lower, porous wall, blind or screen spaces, can be aerodynamically more efficient than the 15 to 25 degree sloped, tightly sealed, hats on high walls that characterise temperate-climate houses in, for example, Australia and New Zealand, or in "Mediterranean" climates. See Kramer & Gerhardt (1983); Eaton (1980); Sachs (1978); and MacDonald (1975).**

A fourth practical, modern purpose of the revival of this style of housing would be to attract a sustainable and sustaining flow of rich and sophisticated tourists to Tuvalu.

Documentation

Tuvalu's heritage of house design, in local island variations of the basic Malayo-Polynesian style, has been recorded in considerable technical detail, in drawings, photographs and specifications, particularly in the following:-

Waterson, Roxana (1991): THE LIVING HOUSE: an anthropology of architecture in South East Asia; Oxford University Press, Singapore.

Hockings, John (1989): TRADITIONAL ARCHITECTURE IN THE GILBERT ISLANDS: a cultural perspective; University of Queensland Press, Brisbane

Woolard, D. Stafford (1988): Traditional Dwellings of the South Pacific; & Austin, M.R. (1988): The Gable End in Indonesia, Melanesia & Polynesia; both in: TRADITIONAL DWELLINGS AND SETTLEMENTS IN A COMPARATIVE PERSPECTIVE; Proceedings of the 1988 International Symposium, University of California, Berkeley.

Koch, Gerd (1961): THE MATERIAL CULTURE OF TUVALU; first published in German by the Museum für Völkerkunde Berlin, now part of the Staatliche Museen

Preussischer Kulterbesitz; and in 1983, in English translation by Guy Slatter; published by the Institute of Pacific Studies, University of the South Pacific, Suva, Fiji, with financial assistance from the Australian Pacific Cultures Fund.

Kennedy, Donald Gilbert (1931): FIELD NOTES ON THE CULTURE OF VAITUPU, Ellice Islands; Volume 9 of the Memoirs of the Polynesian Society, New Plymouth, NZ.

Handy, E.S.C. & W.C. (1924): "Samoan House Building, Cooking and Tatting" in BULLETIN 15 OF THE BISHOP MUSEUM; Honolulu, Hawaii.

Edgeworth David, Mrs (1899): FUNAFUTI, OR 3 MONTHS ON A CORAL ISLAND; Melbourne & London.

The following films (with explanatory texts) are in the **Encyclopaedia Cinematographica** (Editor: G. Wolfe, Institut für der Wissenschaftlichen Film, Göttingen, 1961). These films were made of the construction of the Tuvaluan houses on Niutao by Master House Builder, Saipele, recorded by **Gerd Koch**:

- E409 Construction of a sleeping house;
- E410 Construction of an earth oven hut;
- E411 Production of coconut fibre string;
- E408 Construction of a large outrigger canoe.

Selected detail drawings from these publications, with a range of new hybrid traditonal-modern "ideal homes", need to be brought together in new "How to do it" and "Do It Yourself" manuals for wide distribution and use on all atolls and islands. These can also serve as legal guides to building regulations. They should be somewhat similar to some of AODRO's 1990 to 1993 papers. They should have commentaries in both English and Tuvalu languages.

These manuals could stimulate the creation of a uniquely Tuvaluan architectural and building style and technology. Such a style could be comfortable, healthy, safe, affordable, maintainable, and popular with all types of Tuvaluans on all atolls and islands. It could also create a "niche market" among rich and sophisticated foreign tourists. Cash-rich Tuvaluans and foreigners wanting modern conveniences and luxuries could have them in slightly larger and more costly houses in the same basic Tuvaluan tropical architectural and building style.

Tuvalu's Asian and Polynesian heritages: still alive and evolving.

These traditional tropical house designs and technologies are still alive and evolving in Tuvalu.

The writer took hundreds of photographs of good examples during 1992, but space here permits mention of only a **few random examples**:

- * On **Vaitupu**, a considerable number of houses, **not** destroyed by 1990 Cyclone Ofa, are of Vaitupu's traditional form, design and materials. They are comfortable, give a high quality of life, and are of great cultural interest.

- * On **Fongafale's South Spit**, Ailima, the daughter of Niutao's Master Builder, Saipele, still designs and builds small, affordable, low cost, private enterprise, houses of traditional quality, integrity and charm, despite their low cost and small size (see Findings 8).
- * On **all islands**, local people and Local Island Councils still design and build traditional, or hybrid traditional - modern, houses. Some use corrugated aluminium roof sheeting instead of thatch.

One example (using thatch roofing) is the house-type designed and built (in numbers) by the **Nanumanga** Island Council for Civil Servants stationed there. A close inspection was made of the house occupied in August, 1992, by the family of Ms Tapania Taiki, the 38 year old Staff Nurse/Medical Assistant (Salary Grade 9: \$4,992 p.a.) on Nanumanga. The occupants, and the adviser, discussed the house, including the raised slatted (easily kept clean) floor portion, the low eaves, the traditional blinds instead of walls, and the separate cooking and bathing arrangements. All judged these to be comfortable, well designed and appropriate for a small family of a typical Civil Servant with young children, stationed away from her/his own home island.

Innovation and creativity on Tuvalu, within the traditional architectural culture, is still happening. A young man, **Tenoa**, was building in August, 1992, in the village on **Nanumea**, a remarkable, innovative, 2 storey house of basically traditional style and materials. This house has similarities to houses built by Balinese in Bali to house long-stay foreign visitors, for which the visitors are pleased to pay high lease prices. Tenoa, or whoever conceived the house he is building, could prove to be a valuable human resource asset to Tuvalu.

Another person with great potential, is Tuvalu's first modern-trained (Lae) architect, **Mr Lomiata Niuatui**, who, it is understood, wishes to revitalise Malayo-Polynesian tropical architecture traditions. He is, it is understood, starting to assist and advise the Ministry of Home Affairs & Rural Development.

The **"LIFE AND LIVING IN TUVALU"** programme will need the **full and active participation, in leadership and policy formation**, of community members such as Ms Tapania Taiki, Ms Ailima, Mr Tenoa, and Mr Lomiata Niuatui.

Tuvalu's European, British, American, Australian and New Zealand heritages

By comparison with the Malayo-Polynesian heritages, European-derived ideas about lifestyle designs and techniques (in cuisine, clothing, house-design and building) have only come to Tuvalu very recently. These ideas began to be introduced to Tuvalu in the 1840s and 1850s, by several European trader-settlers, notably the Irish-Australian Funafuti trader, Jack "Tiaki" O'Brien on Funafuti; Martin Kleis on Nui, and Alfred Restieaux on Nukufetau. Some of today's leaders, including top Civil Servants and emerging business people, trace and claim their own descent from these trader-settlers.

The Christian & British heritages

From the 1860's, the Samoan Pastors of the London Missionary Society pioneered

town and community planning (and many other then new ideas) in Tuvalu. They introduced **British and Samoan styles of unified village land use and development planning, housing, and lifestyle design**. These styles were re-inforced and extended after 1909 when **Fongafale Islet** was selected as the **District Headquarters of the British Protectorate**, and later of the brief, but transforming, 60 year (1916-75) **British Colonial Civil Service administration of the Gilbert & Ellice Islands Colony**.

The heritages of Christianity, and of British Civil Service and Parliamentary institutions, have proved of great value to Tuvaluans. They helped Tuvaluans to create an independent sovereign nation-state which is democratic, peaceful, and united socially, culturally and ethnically. **Christianity, and British governmental institutions, travel well and flourish all over the globe, regardless of geography, geology or climate.**

But some aspects of traditional British lifestyle travel less well. Some are more directly linked to geography, geology or climate: these include styles of cooking, clothing and house design. Styles that may be appropriate in Britain, Europe, North America, Australia, New Zealand, or even Fiji, may be quite inappropriate in Tuvalu, within 5 and 11 degrees of the Equator, on small, remote, hot, humid, salty, wet, windy, potentially cyclonic, coral reef atolls and islands.

The American heritage

The year 1942 brought to Tuvalu, particularly to **Fongafale Islet** and **Funafuti Lagoon**, the then astonishing revelation of the awesome power of American capital, technology and determination in war, particularly in **earthmoving, air travel, and other petroleum-powered technology**. The impression they made on Tuvalu has been **deep and abiding**. A total of **67,779** bearing coconut trees were knocked over, borrow pits dug and airstrips created on **Fongafale Islet (Funafuti Atoll)**, on **Motulalo Islet (Nukufetau Atoll)**, and on **Nanumea Atoll**, all in a few months. The latter airstrips were replanted after 1945, but **trees still will not grow properly on their hard surfaces**.

However exciting high-powered, high-speed, earthmoving, vehicular transport, fossil fuel (and nuclear) technologies undoubtedly are, **they are not always appropriate for fragile coral islets and atolls**. This has been dramatically demonstrated on many Pacific islands and atolls. **They can cause massive, long-term, damaging impacts**. Witness the American-created **borrow pits** which are still **Fongafale's** greatest physical problem 50 years after the creation of the Airstrip. Observe also the future long term problems, costs, environmental and social impacts initiated in 1992 by the U.S. military training exercise which spread **bitumen** on top of **Fongafale's** unformed, undrained, ungraded-particle-mix, coral "roadbeds" along its permissive vehicle-access ways.

Donors are generous, and have excellent motives: but gifts are not always without problems for recipients. Economic, social and environmental impact assessments need to be carefully explored before proposals are implemented.

Australia becomes Tuvalu's development partner in housing.

It is only since Tuvalu's Independence in 1978, that Australian donors have been striving to **re-adapt, to Tuvalu, their own adaptations of European-derived concepts of lifestyle and housing designs, techniques and technologies.**

Between 1980 and 1986, 9 Australian designed and donated houses were built on Amatuku Islet for the staff of the Australian-funded Tuvalu Maritime School.

In 1984/5, the Tuvalu Government requested Australia to fund a 5 year programme of **55** additional houses for Civil Servants. The Government could fit **23** more houses on remaining Government-leased land on Fongafale Islet, so **23** were requested there; and the other **32** were to be distributed among the 8 Outer Islands.

The 1984/5 PWD prototype of a Civil Servant's house.

The Tuvalu Government requested the testing of a prototype design by its Public Works Division for a Civil Servant's house. This was a square, 53 sq m, slab on ground, **27°** pitch pyramid roof with a raised lantern, on a reinforced concrete framed, cyclone resistant, 2 bedroom house with a central bathroom, kitchen and cyclone shelter passage way.

During 1984/5, Australia funded construction, by the Tuvalu Public Works Division, of 2 of these prototypes: 1 on Fongafale Islet; and 1 on Nukulaelae Atoll, at the Primary School. The Tuvalu PWD, the Government, and the occupants, seem to have concurred that this house-design was far **too costly, too complicated, too concrete, too square and too uncomfortable to live in:** wind-driven horizontal rain blew in through the lantern; the design proved unpopular. Different designs and methods had to be sought.

The 1985 Samson Report

AIDAB, the Australian International Development Assistance Bureau, commissioned an independent tropical architecture specialist, the architect Tony Samson of Fiji, to design alternatives. Samson submitted a full report dated September 1985 on tropical design principles, detailed house designs, construction details and costings. These were for a well ventilated, lineal 12m x 4.8m, or 58 sq m, house with a raised timber floor; and a **1½ storey**, cyclone resistant **45°** pitch gable roof with a waterproof, **continuous convection ridge vent.** The bathroom and/or the kitchen could be in a separate, close-by structure, linked by a pergola; the design was flexible in floor area; it could be in a range of sizes or "grades". It could be built in Tuvalu, using fully imported, pre-cut, materials. **It is a simple, cool, intelligent design, but still partly "European" in concept, and in fully imported materials.**

The 1988/9 J.S. Hill houses and classrooms

However, it appears from the files that, perhaps during a visit south, Tuvalu decision makers became aware of European/American/Australian style, small 3 bedroom,

double-fronted square houses, fully factory manufactured on a production line, by the large Fijian building and civil engineering contractor, J.S. Hill & Associates Ltd, through its subsidiary, Lami Housing & Joinery. Australia was requested to finance a trial project and AIDAB engaged the Sydney architects, Gazzard, Sheldon & Associates, to assist the Tuvalu Government to specify the details it wanted in a J.S. Hill style house. The contract, finally won by J.S. Hill, was administered by AIDAB, on the basis of a house design selected and approved by the Tuvalu Government.

Ten of the J.S. Hill houses were fully imported and erected in Tuvalu, apparently by J.S. Hill people from Fiji, during 1988 and 1989. Eight of these were funded by Australia, and two by New Zealand. Six were erected on Fongafale Islet, and 1 each on the Outer Islands of Nanumea, Niutao, Nui and Nukufetau. All, presumably, have been occupied by Civil Servants since 1989. In 1989, Australia also funded the import and erection on Fongafale Islet, of 3 prefabricated J.S. Hill buildings for temporary use as primary school classrooms, and later conversion to 6 houses for Civil Servants. By 1992, these were no longer being used as classrooms.

J.S. Hill claimed large sums as "extra costs" for the houses, additional to the original contract sum. After much difficulty, and additional administrative costs, AIDAB was obliged to approve the extra costs as justified, and to pay them. **The J.S. Hill houses are believed to have cost between 5 and 10 times the cost of a normal, contemporary, middle class, privately-built, Tuvaluan house.**

The J.S. Hill houses are about 60 sq m in overall floor area, including a small porch, which gives them an old-fashioned (1950's) Australian low-cost "double fronted" look. They are close to a square in plan, with **tightly sealed, low pitched roofs**; with a few **narrow vertical windows** filled by glass louvres and timber storm shutters; internally they are partitioned into a number of private European style "rooms".

The design makes adequate cross ventilation, and convection cooling, impossible in Tuvalu's climate. The design may be bearable in mountainous Fiji, which is much further away from the Equator. There are 3 exceptionally small, private, box-like bedrooms, climatically and culturally inappropriate in Tuvalu. The **sleeping patterns** of occupants vary with the location of the house, the season of the year, and the number of visiting relatives. Some locations are more exposed to easterly breezes than others; some are more exposed to wind-driven rain. Occupants interviewed in 1992 advised that the bedrooms are mostly used only for storage, or for short periods of marital privacy. Where electricity is available, the Government has supplied an **electric fan**. When this is working, it is mostly used continuously in the combined kitchen-dining-living space, where most people sleep: this is costly in electricity. People also say they, or their visiting relatives, often sleep in adjacent self-built, open, pavilions (traditional fales), or in the open, unwallled, community maneapa.

There is a small, poorly ventilated bathroom with a **shower** served by a header tank. Where electricity is available (only on Fongafale Islet) the header tank is filled by an **electric pump** (possibly an automatic one); elsewhere a hand pump is supplied. Occupants report these pumps as liable to breakdown, and the electric pumps as costly to operate and maintain. (see Findings 22, pp3 & 7, on pp 61 & 65 of the Volume).

The 1990 Project Appraisal Mission Report and Recommendations

In 1990, AIDAB's Project Appraisal Mission (Messrs Dickson & Cholerton) observed, and were informed of, these types of problems with the J.S. Hill houses. The Mission reported that costs and administrative problems had been excessive, and had produced **"poor results** for Tuvalu and for Australia. It is obvious that future developments in Tuvalu should **not** be implemented in this manner."

The Executive Summary of the 1990 Dickson-Cholerton Appraisal Mission Report noted **vagaries in population estimates** since the 1979 Census; the need to consider **privately** financed and built housing as well as **Government** financed and built housing; problems of **land tenure and acquisition** by Government; the strong **cultural** tradition and extended family lifestyle; the dominance of **Government employment** as a source of cash income; and the **British legacy** of civil service housing provision. The Executive Summary concluded:-

"The Mission identified **key issues** which need to be addressed in any review of the housing sector. These include:

- "(a) The perceived **urbanisation of Funafuti**;
- "(b) The assessment of housing demand including standards and **affordability for the public and private sectors** on Funafuti and the outer islands;
- "(c) The development of an **equitable** method of delivery of housing including both **private and public capital**;
- "(d) The need for a **comprehensive land planning and management policy**.

"The **main recommendations** arising from the Mission are that:

- "1 A **working group** within the Government of Tuvalu be established to review housing policy and to prepare a strategy for housing development;
- "2 A **housing sector review** should identify issues and policy options, key resources and constraints (urbanisation, housing demand, affordability, services, access to land, financing and management), preliminary goals and objectives, and existing policies which influence decision making and strategic planning for housing. Any review should also include the preparation of short term action plans for selected high priority issues based on identified goals, objectives and related policies;
- "3 At the completion of a review of the housing sector it is expected that issues, options, resources and constraints will be **sufficiently well identified and documented to allow the Government of Tuvalu to:**
 - (i) formalise an appropriate housing policy together with objectives and strategies for implementation; and

- (ii) prepare Project Requests to relevant donor countries for assistance with development of housing in accordance with adopted housing policy.

"4 At the completion of the review of the housing sector, recommendations will be made as to future Australian participation in the Tuvalu housing project".

The 1991 endorsement by the Tuvalu Cabinet of the AIDAB Appraisal Report and Recommendations

By letter dated 25 June, 1991, the Secretary, Ministry of Foreign Affairs and Economic Planning, Tuvalu, advised AIDAB that **"the Dickson - Cholerton Report has been endorsed by the Cabinet. The recommended team task force to conduct the Tuvalu Housing Policy Review has been appointed"**. The Tuvalu Government requested AIDAB to provide a consultant to assist the team / task force to review Tuvalu housing policies. On 30 April, 1992, AIDAB signed a contract with the author of this Report, appointing him to act as advisor assisting the Government of Tuvalu.

The Findings

The field work, discussions, interviews and desk studies of the advisor have led to the compilation of Findings on matters of fact as surveyed and understood by the advisor.

The Findings indicate a need, 20 years after the production of Ball's 1973 comprehensive physical development plan for Fongafale Islet, to produce another such co-ordinated land use plan and development design for the urban capital Islet; and to control land use and land development in accordance with such a plan. This should be done on the basis of revised national strategies to seek a style of development which is sustainable in economic and environmental capital, and recurrent, costs; and which is less centralised on Funafuti. That implies a need to set and monitor targets for the locational distribution of land use, investment, population, institutions, productive employment, infrastructure and locally built housing, among the 9 Atolls and Islands, and within each Islet, Atoll and Island.

The Findings also indicate that some very **basic principles and forms of house design and construction** can be derived from analysis of basic shelter and health needs in Tuvalu's climate, and from analysis of the limits of affordability. These forms include a **45°**, pitch well-ventilated, low-eaved roof over a raised floor platform, with all framing tied and pinned, preferably without the use of any metal which can corrode under any circumstances. They also include ideas about the design of tropical bathrooms and kitchens, and appropriate ways of conserving and dispensing water.

However, beyond those basic shelter principles, the Findings also indicate that **ideas about the purposes and design of "a house", vary with different social, cultural and personal concepts of life and living in a particular environment, in a particular community, at a particular time.**

Tuvalu has heritages of a multitude of different ideas about lifestyle and house design, from two different regions:

- (a) from Malayo-Polynesian tropical island South East Asia, via such islands as Samoa, & Kiribati; and
- (b) from the U.K., America, Australia & New Zealand, all temperate/cool climate, continental, industrialised, lifestyle and house design ideas.

The people of Tuvalu must evolve their own lifestyle and house design by learning about, discussing, selecting and experimenting with practical ideas from each of these heritages. This can only be achieved through a continuing cultural process, involving community participation in the evolution of LIFE & LIVING in Tuvalu.

Findings 25:**LIFE, LIVING & HOUSING IN OUTER ISLAND COMMUNITIES:****implications of the Government's 1992 Objective of****"long term growth of the economy,****without undue corruption of social and cultural values:"**

Central Government strategies and policies, especially those which affect housing, interact with the everyday feelings, thoughts and actions of families and communities, from generation to generation.

Housing also interacts with the national economy in major ways. A major industry (in terms of investment of time or of money, and in terms of formal or informal jobs) is the industry of house planning, design, building, supervision, maintenance, renovation, alterations and additions, furnishing, equipping, management, leasing, rental, and eventually, redevelopment. Investment of surplus time and labour, or of disposable cash, in land development for housing or tourist accommodation, can be a source of cash income (e.g. for retirement) or of capital gain. All of these possibilities interact with the social and cultural context.

The housing advisor's study-tour of outer island communities in August, 1992, confirmed that much can still be learnt about these past, present and emerging interactions from the documentation by social and cultural anthropologist Anne Chambers. Mrs. Chambers spent years (1973 & 74; and 1984 & 85) in field research in Tuvalu, particularly in discussions with the people of Nanumea, in their own language and in their own homes.

The documentation is in:

Chambers (1986): Reproduction in Nanumea (Tuvalu): an ethnography of fertility and birth; Dept of Anthropology, University of Auckland, Working Papers No. 72; 340 pages; and

Chambers (1984): NANUMEA: atoll economy and social change in Kiribati and Tuvalu; Report No. 6, published by the Development Studies Centre, Australian National University, Canberra; 341 pages. This reports the results of 21 months of ethnographic and archival research between 1973 and 1975. The National Library of Tuvalu has a copy of the first edition of this Nanumea Report, produced in 1975 at the Victoria University of Wellington, NZ.

The following extracts from Chambers (1984), Chapter 14: "Conclusions and Suggestions", are relevant to future housing strategies and policies for the 1990's and beyond. The current editor has inserted sub-heads, and a few explanatory words between round brackets.

A society of strong local island communities

"....the most striking characteristic of Tuvalu society is the strength of its local island communities. This strength is evident in.....the **active participation by almost**

everyone in community activities, in meetings, feasts and festivities, and in work projects...."

Local sharing of subsistence and cash resources

"Local community strength is also materially demonstrated by the **large amounts of individual and family resources available to the community as a whole....** workers (in cash employment, off and on the island) make annual cash donations to the **island fund**all islands respond enthusiastically in making church contributions.....those at home work together in building projects....generosity is repaid with increased social prestige."

[Chapter 12, p252: "The island as a whole (the Nanumea community, separate from the Church and the Island Council) has a large sum of money of its own (about \$28,000 in 1974), most of which is deposited in accounts with Australian building societies. This fund continues to expand yearly from employed Nanumeans' contributions and the interest received and is **earmarked to rebuild the village at some future date.**" (This rebuilding was later largely done during the 1980's)]

Local social controls

"Social control mechanisms minimise friction among individuals, making the **Tuvalu communities extremely peaceful places to live in....**people tend to eschew activities that may result in public shaming...Even **land cases**, which may involve several generations of rancour and bitterness, can usually be settled with at least surface amicability and most people do not feel a need to lodge appeals against decisions handed down by the local (Lands) court."

Local island pride and competitiveness

"The **intense island pride** that is also an obvious Tuvalu characteristic derives from the strength of each local community...competition....**Island pride...can spur communities to improve village facilities** and inspire clean-up campaigns."

Shared community values

"Community solidarity in Tuvalu can exist in strength largely because **nearly all members share a virtually identical cultural outlook and the same ideals.** Nearly everyone has shared the same experiences as well. These outer island societies are small...people usually live together in a single village, and relationships between residents take the form of face to face encounters into which personalities, kinship and past history freely intrude".

Chambers warns of the danger of cash pricing of subsistence goods

".....it is **nonetheless true that** as individuality is emphasised, community solidarity is necessarily decreased."

"a social organisation which enables everyone to have access to the local subsistence resources they need....is accomplished at present by extended kinship groups, ideals of generosity between relatives (and neighbours), and the custom of adopting landless strangers into local families. These traditions seem likely to be threatened only by an increased level of monetary transactions, which can put a cash value on subsistence goods which at the present carry no price".

Local island competence and skills

"Another important characteristic...can be termed the competence of individuals. An island community can usually mobilise any skills it needs from among its own members, though it may have to wait until some of them return home on vacation. Tuvalu people possess a wide range of skills, both traditional ones and those appropriate to western society....skilled people are usually pressed into community service, and this should be encouraged....Government policy should strive to use these skilled members of the population (on each island) and consider training them (as well as others) further, (on their own outer islands), rather than bringing in experts or volunteers from (elsewhere)" (or taking trainees to a centralised school: see p.319).

The cultural cringe: foreign is better

"A third contemporary characteristic is clearly (now) detrimental to Tuvalu....the 'pouliuli' myth. This attitude assumes that traditional Tuvalu culture is inferior to western (european), that local customs belong to 'days of darkness' (pouliuli) and must be replaced by enlightened ones from European culture...."

"A (continued) acceptance of the pouliuli myth poses several problems for Tuvalu.... Rejection of Tuvalu culture by its members can only lead to their becoming second class members of whatever culture they adopt".

"The (self) denigration of Tuvalu culture also impedes wise decision making. Decisions must be based on the real cultural situation that exists and should use locally acceptable models rather than overseas imports..."

Equality, sharing, harmony, and the Church of Tuvalu

"I found that, on Nanumea, several premises were widely accepted, and formed the general basis for outer island life:

- * "Virtually everyone was considered to be equal...."**
- * "Sharing of resources is called for between relatives and neighbours...."**

- * **"People value highly the maintenance of social harmony....more important than.....abstract individual integrity, absolute truth or individuality...."**
- * **"Most people also believe that God takes a direct interest in human life, dispensing favours and giving guidance..."**

"It is important to note that the premises of life in (most of) 'western' society are quite different: they are generally the opposite of those described above."

Ways to avoid local community decay and outer island depopulation

"Nanumeans express a basic satisfaction with their present style of life...." ".....to maintain this level of satisfaction....ways are going to have to be found immediately, to maintain outer islands as interesting, fulfilling places to live in, and to retain their present high standards of living."

"A method that could effectively be used to ensure ...continued satisfaction...with...outer island life, is to insist that development of the Capital (Fongafale Islet) remains commensurate with outer island development... This method necessarily involves a decentralisation of government services."

"Another method that could assist the goal of maintaining an interesting outer island life is to insist that (off-island) labour contracts be temporary (and rotating, see p.177), with workers necessarily returning home after a short time abroad. This would spare Tuvalu the community decay that now afflicts the Cook Islands, the Tokelaus and Samoa, all of whom have lost the most active segment of their populations to permanent overseas migration."

Local planning for local housing

"Most Nanumeans find it difficult to name specific changes that could improve their outer island life. Those that were most commonly mentioned to me, included only building projects: metal roofs to eliminate the need to make thatch, and to catch water, a piped water system, an airstrip, a wider reef passage."

"This bias can also be found in the...government's fixation on building with imported materials in its development projects and plans; and in the literal translation of the word for 'development': fakatuumea or 'to build things'." (In English, to 'develop' means 'to evolve, unfurl, unfold, flower, into a more full and mature form')."

"Most people on Nanumea seem to hold the implicit view that their future possession of a dwelling house built from imported materials, would constitute development. They deem metal roofs to be specially important, because of the drinking water they could collect and the thatch making that could then be discontinued."

"The main indigenous plan for development that Nanumeans have set out, calls for rebuilding the village houses with some imported materials, and the plan at present stipulates a cement foundation and a tin roof using traditional design and timber. Probably all of us, even those who prefer thatch for its aesthetic value and coolness, would agree that this plan does offer some benefits. These exist mainly because the imported materials are incorporated into a local design and do not require the use of materials that duplicate such locally available resources as timber.

"The Nanumean plan does away with the great problem inherent in most of the buildings that have been built to date in the colony with imported materials, since the Nanumean buildings are to be designed for the climate they are to be used in. Certainly the use of imported materials need not call for the production of walled-in sweat boxes. Open sides allow occupants to enjoy prevailing winds for coolness and to watch the flow of passers-by.

"At this point it is necessary to realise that outer islanders presently value imported material buildings, both for their utility and for the prestige connected with living in them."

"Government should do all it can to see that all future villages do not consist of dilapidated boxes and should encourage outer islanders to consider maintenance costs before they rebuild and to use building designs that suit the Tuvalu climate and culture. The best way it can do this is by setting a good example in the new capital housing areas. It should also recognise officially that the use of local building materials benefits the group's economy by reducing overseas expenditure. Furthermore, if local building materials are bought from other outer islands when they are not available in the capital this can assist the local economy by increasing the internal circulation of money."

Chambers' pre-Independence conclusion

"the Tuvalu outer island life-style is a viable one that should be preserved and augmented. During the course of my fieldwork on Nanumea I could not help noticing the general contentment that permeated daily life and the high levels of personal satisfaction that people were generally able to obtain. I sincerely hope that, whatever changes may come with the future, Tuvalu will retain these qualities intact. And I firmly believe that this can only occur if future life-styles retain all that is good in the traditional one. The important point is that Tuvaluans do not eventually end up in the truly pitiable position of regretting the loss of some parts of their culture, which can never again be recovered once it has disappeared."

Chambers' post-Independence observations

Chambers (1986) updates her pre-independence observations:-

"outer island residents have migrated to (the capital and seat of the new national central government) in search of employment, specialised medical and dental care, diversion, or escape from social pressure at home.... yet **despite these 'bright light' attractions, loyalty to home island communities remains strong, and the outer islands are the heart of Tuvaluan life.**"

"The village houses are arrayed in orderly rows and their design suits the tropical climate well. **Most have thatched roofs and open sides, with plaited shutters** that can be let down for privacy or for protection from stormy weather. In the course of a recent (village) rebuilding project, **raised cement floors are replacing those of coral gravel, and, in some houses, cement pillars rather than traditional wooden posts** support the roof...trees, flowers, and bushes..provide **some screening between houses.** Nevertheless, **privacy is minimal, and little escapes the notice of neighbours.**"

"The **main-village rebuilding program.....**has commanded the energies of the communal workforce over the last two years..."

"At the centre of village life, both symbolically and geographically, are...the community meeting hall (Ahiga, Maneapa) and the Church...."

"it is no longer considered necessary for members to reside within the geographical boundaries of their village 'side' (feitu). Residence outside the formal village areas has also become more acceptable. Thus many families have shifted, building houses that are often larger than central village ones, on land that they themselves own (**People are increasingly coming to feel uncomfortable about living on land owned by someone else**). Many of these houses have been constructed in an area between the local hospital and the village boundary, resulting in a more spacious village layout."

"Somewhat smaller and less substantial houses tend to be built by those who have chosen to live some distance outside the village. This twin desire for more privacy and for residence on one's own land has given impetus to **the community's recent decision to rebuild the village houses, probably the third time such a project has been undertaken this century.**"

"Community solidarity (loto fenua) serves as a charter for decisions and projects that seek to maximise the well-being of the community as a whole. Community solidarity is tangibly represented by the sizeable island fund, by impressive public buildings built and maintained by contributions of materials and labour, by the frequency of feasts, village meetings and festivals, as well as by the cordial atmosphere that characterises public decision making...."

"Equality is an ideal.....the sharing orientation of the local exchange system helps to make this ideal a practical reality.....**wealth derives...either from extensive lands or from remittances from workers**" (either in Funafuti or overseas).

"Nanumeans tend to distinguish between....internal community affairs (te fenua) and central government (te malo)....The community's relationship to the central government is mediated by the Island Council, comprising 6 elected members and several nominated members representing special interest groups, such as village 'sides' and island women....Normally the Island Council cooperates and consults closely with traditional leaders."

"Money.....has become a household essential....to buy store goods, to pay local taxes and school fees, and to make donations to church and community projects...fieldwork impressions are of a comfortable economic situation...of relative affluence."

"Many Nanumeans have now participated extensively in overseas market economies, and, perhaps more influentially, those transactions have become the norm in Funafuti. Radio broadcasts contain news about government funded projects to foster the development of small businesses. There is the pervasive assumption that these will give outer island producers more access to cash incomes....it is hoped this will reduce population movement to the capital."

"However, local business enterprises compete with and inevitably undermine the traditional exchange system, based on sharing (rather than selling) surplus resources. Thus, encouraging 'development' in outer islands will help to destroy the 'traditional social system and customs' which the government explicitly seeks to preserve. They will also engender changes in family socio-economic strategies, inter-personal relationships, and fertility decision-making."

Desires for future retirement cash remittances, prompt demand for sons, education and out-migration

Because the cash economy is being expanded, because imported goods are more and more desired, and because there is not yet any alternative way of investing (e.g. houses for rental), people want sons; a formal modern education or training for them; and out-migration to seek jobs in the expanding Capital (Funafuti) or overseas. See Chambers (1986) pages 283-4:

"parents (on Nanumea in 1984) actively hope to produce remittance earners, and most feel that this necessitates having more than one son. As one women said of her only son: 'One is not enough. If he goes away to work, there is no one to look after me here. If he stays and cares for me, no one earns any money overseas'

"Another women recognised that her husband had been right to insist that they needed more children: 'He said that if we had many children, we might have a smart one who could go on to school and get good work. He will be our road to money and imported goods'."