SOUTH PACIFIC ENGINEERS ASSOCIATION

Policy

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The Role of Engineering in Sustainable Economic Development in The South Pacific

1. Inter-relationships of economic, social and environmental goals

All nations and their elected governments wish their citizens to be able to live with a reasonable level of economic prosperity, to enjoy educational, health and social services that enable them to live their lives in dignity and without hardship, and to do so in a manner that ensures that negative impacts of human activity on the environment are acceptable, and increasingly minimised.

Many components of good-quality health, educational and social services, and clean technologies to protect the environment must be purchased by nations from the international marketplace. To be able to afford reasonable standards of social and environmental services, nations therefore need to build their economic prosperity.

The most frequently used indicator of prosperity is the gross domestic product (GDP)/capita. GDP/capita is made up as the product of labour productivity (GDP/hour worked) and labour utilisation (hours worked/person). Labour productivity is the product of value created per hour worked, and overall economic efficiency of the economy. Hence we have:

Prosperity (GDP/capita) = *(Value created/hour worked) x (economic efficiency) x (labour utilisation)*

Whilst greater prosperity is possible by people working harder (increasing labour utilisation), the bigger gains are through improved economic efficiency (e.g. better regulation and infrastructure, improved processes of government, elimination of corruption), and through using the skills of the people to create value (which in turn requires higher levels of education).

The *World Development Report 2005* demonstrated that poverty elimination and economic growth (indexed as GDP/capita) are highly correlated. The proportion of the GDP/capita that can be spent on health and education does not vary too greatly between similar nations. Therefore growing GDP/capita is a vital goal for any nation wishing to look after its people better.

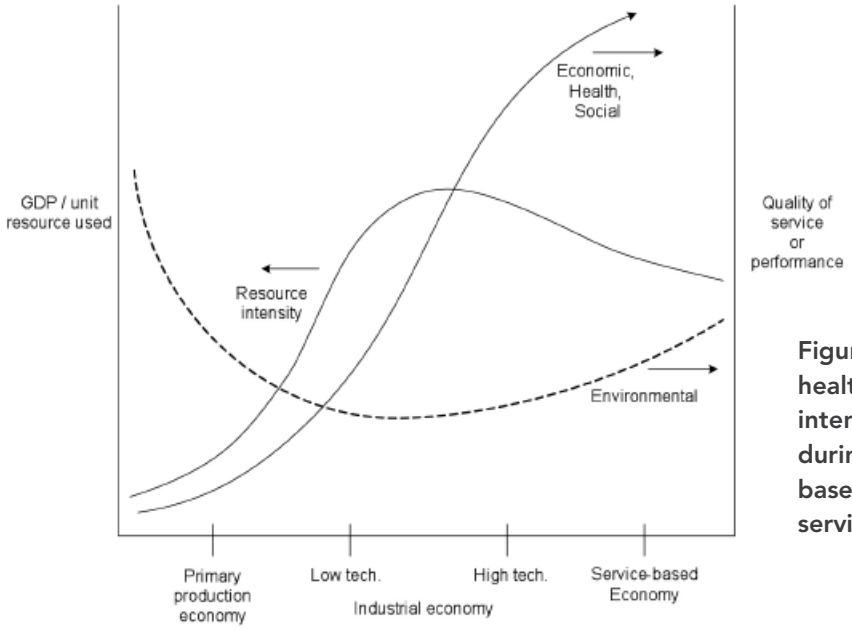

Figure 1: Changes in economic, social, health, environmental and resource intensity performance of economies during the transitions from primary-based to industrial-based and then to service-based (illustrative only).

2. Economic growth – the South Pacific is unique

Figure 1 shows conceptual trends in the historic four stages of economic development.

- The first stage is primary production-based economies – this is the level that the poorest nations operate at.
- The normal second stage is the development of an industrial economy in which there are low-quality, low-skill, low-paid jobs using often outdated equipment that is uneconomic to run and too polluting in its effect for more prosperous economies to continue using it. This stage can be highly polluting and involve lowest standards of occupational health and safety. Many developing countries have difficulty exiting this stage because it is necessary to improve the skill base of workers to do so.
- The third stage is usually a continuation of the development of an industrial economy but capital for better equipment and better training of workers is deployed, and the remuneration of workers increases.
- The fourth stage is the transition to a knowledge-based service economy. The pay rates are high, the most advanced technology is deployed, environmental impacts start to lessen and better social services can be afforded. Manufacturing still exists, but through the use of advanced engineering which is highly automated, efficient in use of resources, and has low environmental impact.

Many parts of Europe are transitioning towards a knowledge-based service economy. In contrast, some of the largest population countries in the world are in the second stage of development. They have rapidly increasing demands for resources, and are experiencing environmental problems of some magnitude. This is a major concern both for those nations and globally.

For most nations in the South Pacific, the means for economic development will not conform to this conventional model because of their low population by global standards and because they are not sufficiently well-connected to efficient global transport systems. This means that except for one or two larger countries in which there may be some labour-intensive manufacturing, Pacific nations need to find a unique means for economic development that is suitable for the region. This remains the greatest challenge that national governments and regional leaders face.

3. The nature of economic development in the South Pacific

Except for the small number of nations that have a major energy or mineral export industry, one major goal must be to raise foreign exchange, for the purpose of paying for imports of equipment and things that cannot be produced locally. Another is to ensure that the needs for imports are minimised by ensuring that local suppliers can compete effectively where they have the competence to do so. A third goal is to maximise the value of tourism. Nevertheless, the continuation of repatriation payments from family members in higher-wage economies will continue to make an important economic contribution in some Pacific nations for a number of years to come.

Whilst the importance of tourism for raising foreign exchange earnings cannot be disputed, over-reliance on tourism can have inherent risks. Tourism is characterised by a large number of service workers, so the average value per hour worked in the tourist sector is generally lower than in other sectors of the international economy. Therefore, whilst tourism can lift the standard of living of a South Pacific nation to a much-improved level, it can never deliver a standard of living similar to that found in a developed industrial nation.

Sustainable economic development for most nations relies on environmentally responsible development of the tourist industry, developing agriculture and fisheries as much as possible to minimise food imports, exploiting forest, mineral or energy resources in a responsible manner, and taking up any opportunities for manufacturing, either for local consumption, or if viable, for export. In this context:

- Safe and reliable infrastructure is vital – tourists and businesses need reliable electricity supply, broadband, safe public transport, a water supply that can be consumed without concern, safe food handling and so on. They have reasonable expectations that the infrastructure and buildings will withstand all but the worst geohazard and climatic events. SPEA has published separate advice on resilient infrastructure and disaster management.
- At a second level, there is a need for environmental protection – tourism can only achieve the greatest possible returns if there is good environmental management. The natural amenity value of the coastlines and other natural features that visitors come to enjoy cannot be put at risk. Particularly critical in this respect is the means applied to treat liquid waste and manage sold waste. Aquifer contamination of seepage into lagoon areas is preventable and unacceptable. Flood mitigation is also important.
- At a third level, the amenity value of transport facilities is critical – visitors and businesses use the roads and airports, ferries, buses and taxis.
- Fourthly, the amenity of building structures is important. Hotel rooms that are safe and in which all facilities function reliably are more important to maximise returns. Businesses also need suitable premises.
- Lastly, if manufacturing is to exist, then competitive edge through using high technology to make products with unique Pacific attributes is the best way to obtain high returns per hour worked.

The challenges in the Pacific region are greater than elsewhere because of the joint tyrannies of isolation and small local markets.

4. Lifting economic efficiency

Every country can make gains by increasing its economic efficiency through measures such as:

- Ensuring the regulatory environment imposed by governments is effective and efficient. This means that there need to be clear market rules, absence of corruption, political stability, and adherence to intellectual property laws.
- Developing a fair taxation system, including a clear goal to generate public-sector capital for investment in infrastructure.
- Ensuring capital investment in public infrastructure is effectively applied. Having national infrastructure (transportation, energy supply, and telecommunications) that works well allows goods and services to flow readily within the economy. Infrastructure must also be

resilient and there must be proven means to resist climatic and geohazard events.
- Having good-quality housing stock, water supply and waste treatment so that as few people as possible suffer debilitating illness and are therefore available to be productive. This also raises labour utilisation.
- Maintaining a healthy and stable investment climate to generate private capital investment. Even in developing countries, the bulk of the capital is locally derived, and not from foreign direct investment (FDI), although the latter can be an important contributor when needed.
- Government acting as a lead procurer of new technologies from elsewhere so the people can benefit.
- Government making new technologies such as Internet and broadband affordable for general public use to improve access for learning and to promote business opportunities.

As economic efficiency improves in an economy the taxation system can then deliver the economic resource needed to lift environmental and social standards.

Whilst aid can make an important contribution to development of an economy, there is a major risk if infrastructural facilities and amenities for a nation are provided through tied aid. In a tied aid situation the technical standards to which the asset has been designed may not be suited to the local environment the asset must exist in, and the skills to maintain and operate the asset may not currently exist. Further, tied aid can have a detrimental effect in that local providers may be shut out of economic opportunity.

There is no reason why Pacific nations should pay less attention to these matters than any other nation.

5. Needs for technical capability

Improvement of economic efficiency by the above means can be hindered if the nation does not have the technical capability to make good technology decisions. The world has numerous examples of capital wastage through unsuitable technology being imposed on developing countries because there was not wise buyer capability. The risk of poor decisions unfortunately increases when governments do not recognise the need for technical expertise. The needs are:

- technically literate government officials (engineers and scientists who have learnt public policy) who can advise on key policies, e.g. deforestation, environmental standards etc., and who can create the policy conditions to attract and responsibly use potential foreign direct investment
- technically literate businesspeople (engineers, technologists and scientists who have learnt business) who are likely to be able to attract capital and use it wisely so that internationally competitive businesses can be built
- engineers with the skills and knowledge to spend public capital effectively to deliver the most useful infrastructure projects for a nation, and then to operate and maintain those assets.

Improving value creation per hour worked also requires a technically literate workforce (to run modern technologies), but also technical capability to undertake investment projects.

6. Policies for engineering standards

To utilise technical capability effectively, it is important that nations have the following policies in regard to standards.

- An ongoing national commitment to use internationally recognised engineering standards and codes of practice and internationally recognised forms of contract for engineering service procurement.
- An ongoing national commitment to build engineering registration or licensing systems that are benchmarked to international best practice.
- When procuring engineering services, ensuring that those local providers which have demonstrated the ability to operate at good standards are given the opportunity to compete on equitable terms against overseas providers.
- When forced to procure engineering services from overseas, a commitment to only accept proposals from organisations which have demonstrably committed to international best practice (e.g. through membership of a national

consulting engineering company association under the umbrella of the International Federation of Consulting Engineers (FIDIC)), which use engineering professionals holding internationally recognised quality marks (e.g. IntPE: the International Professional Engineer quality mark established under the Engineers Mobility Forum), and which have attempted to find and work with local companies, thereby leaving enhanced local capability in place afterwards.

If these approaches are pursued, the people concerned will make good decisions, even if there is no defined technical standard. Nevertheless, development of regional technical standards might also be pursued, e.g. through a co-operative programme co-ordinated through the Pacific Islands Forum.

7. Human resource development plans

Developing nations need human resource development plans to ensure they have the necessary capacity and capabilities. However, because of the region's low population, for the South Pacific the human resource development plan needs to be regional rather than national. These plans must have several parts.

- A commitment to educate key personnel to internationally benchmarked standards. Even when there are not sufficient funds to educate a large number of people to high standards in engineering, science and business, at least some must be educated internationally to the best standards available.
- A commitment to identifying and creating a supportive environment that is free of bias so that people from all racial, ethnic or cultural groups within the nation, and of both genders, are able to access and participate in relevant education.
- Where there is no other alternative, selection of individuals to be educated overseas to learn and bring back knowledge and skills. The wise choice of external host country is vitally important – too often international students from developing countries have been given projects totally unrelated to the needs of their own nation, and they cannot be effective on their return. A recommended scheme is international study with time spent partially in the host country and partially at home. The host educational institutions in other countries must be selected on the basis of them developing interest and understanding of the needs of the students sent to them. Without the right support mechanisms in place, many students sent to study overseas do not return to their home country.
- Development of lead national programmes benchmarked to international standards using both nationals returning home and key partners from overseas institutions. For engineering, widely used benchmarks are the Washington Accord four-year professional engineering degree programme, the Sydney Accord three-year engineering technology programme and the Dublin Accord two-year programme for engineering technicians (more information can be obtained at www.ieagreements.org).
- Development of lower-level programmes and upgrade plans to eventually move all qualifications to the benchmark standards.
- Ongoing professional development programmes for selected engineering and business personnel to assist them move into public policy and capital project management in government.
- Creation of improved social status and salaries for the best engineering performers so that they remain committed as teachers, as public servants spending national capital, and as the forward thinkers acting to develop and enforce environmental standards. Having the right culture for the skilled people to work in is as important as them having the right technical qualifications. The recognition of engineering leaders will act to inspire and bring forward a new generation to study engineering whose contribution to their nation will be greater because of their engineering knowledge.

Appendix 1 is a useful checklist that can assist in evaluating plans.

Because the effective use of capital is a primary goal in the education of engineers, giving precedence to engineering education over many other educational fields is vital. In a separate paper, SPEA has set out a proposal for the engineering component of such a plan.

8. The contribution of the South Pacific Engineers Association

Developing sustainable futures for Pacific communities will continue to be a challenge for both governments and for professional support communities. By involving its professional engineering community as a key player in the development of economic development plans, governments can ensure the best-possible use of capital and resources, thereby maximising the potential to deliver improved standards of living for the people of the countries and the region as a whole.

9. Reference

World Development Report 2005. "A better investment climate for everyone". Published by the Word Bank and Oxford University Press. Available at http://siteresources.worldbank.org/intwdr2005/resources/fnl_wdr_sa_overview6.pdf

10. Disclaimer

The South Pacific Engineers Association (SPEA) is the non-aligned association of national professional engineering bodies in the South Pacific. It seeks to contribute on matters of national and regional importance. One part of its contribution is to issue position papers, which give a learned view on important issues, independent of any commercial interest. Such notes are not consensus papers of the Association membership, although they have been widely peer reviewed amongst the membership. Others are free to quote or use materials from this note.

Appendix 1

Checklist for evaluating technical capacity building plans

Current situation

1. What are the engineering programmes currently producing graduates? How many are graduated each year, and is this consistent with other similar nations noting that one third of graduates in engineering is normal for nations seeking to develop quickly?
2. What quality assurance systems (e.g. accreditation) are currently in place for the engineering programmes, and do these reference to internationally recognised standards such as the three Accords?

Assessment

3. Is the quantity of engineering graduates sufficient for current and future needs?
4. Is the current quality assurance system adequate for country purposes, and appropriate for mutual recognition agreements in the global arena?
5. What is needed to enhance current engineering programmes to global quality? (e.g. lab upgrades, faculty development, computers, library, etc.)

Needs

6. If the quantity of well-prepared engineering graduates is insufficient for current and future needs, what is needed to increase the flow? (e.g. additional schools or programmes, increased size for current programmes, more financial aid for students, etc.)
7. If the quality of programmes and their graduates is below global norms for competitiveness, what remedies are needed? (e.g. develop an accreditation system)

Plans

8. What is planned to meet any needs for increased quantity of well-prepared engineering graduates?
9. What is planned to meet any need for increased quality assurance of engineering programmes?
10. What plans are in place for retention of well-educated engineering and other graduates in the nation's public service and for professional development of those graduates to make excellent policy decisions?

Funding

11. What are the financial needs to accomplish needed quantity and quality enhancements?
12. What sources of funding are available? (e.g. government, development banks, industry, tuition, etc.)

Leadership

13. What is the time line for execution of these plans?
14. What evaluation/assessment mechanism will track progress and review results?