

Challenges of Environmental Resources Development In Penang Island, Malaysia

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ABSTRACT

This study examines the challenges due to environmental resources development (ERD) in Penang Island. In this context, ERD refers to land use planning (LUP). Penang being the second most industrialized state in Malaysia needs more space to build industrial zones, housing estates and commercial parks. These contributed towards the changing of landscapes due to development and consequently change the physical environment. The development process adheres strictly to the economic demands achievements as reflected in the Penang Structure Plan since 1970's, 1980's, 1990's and 2000's, and little attention drawn to the environmental heeds. This study uses two research strategies: (1) a qualitative analysis of data and (2) two case studies. Data were collected from government policies, development plan reports, interviews and other published reports. The Second Penang Strategic Development Plan (2001-2010) argues development policies enhance environmental sustainability in the Island. Unfortunately, general observation shows otherwise; since 1990's the natural vegetation declined to 9%, the entire mangrove fringe on eastern region of the Island has been reclaimed, most of the major rivers has been polluted beyond repair and the permanent forest being encroached at a 1% annually.

Keywords: environmental resources development, environmental management, land use changes, sustainable development, environmental policy, development policy

INTRODUCTION

Malaysia which aiming to achieve industrialised status by 2020 is try to sustain its economy averaging between five percent and eight percent GDP per annum over the past ten years. Parallel to the robust of the National economy; Penang, one of the fastest growing states in Malaysia, with high ambition of achieving the industrial status by 2015 also facing serious environmental degradation.

Penang Island has a total area of only about 295 sq. km. About 49.2% of this area is above the 65m (200ft) contour line. Generally land above 45/60m (150/200ft) becomes very steep and thus unsuitable for development. About 65sq.km or 22% of the total island area has already been built up. Large part of the island has also been gazetted under various Acts and Ordinances for the purposes of conservation, protection or maintaining a particular use in a specific area. These include the gazetted Hills Lands (under the Land Conservation Act 1960), the Forest Reserves (Forest Ordinance), the Irrigation and Paddy Land (Irrigation Areas Ordinance) and the Water Catchments Areas. Lack of supply and high demand of developable land in Penang Island have made land prices fairly high since 1970.

As far as Penang Island is concerned land is the most important commodity which can shape the future of the island. How land is used, and thus land cover is altered depends on who owns or

controls the land and on the pressures and incentives shaping the behaviour of the owner. More than 90% of the land is privately owned (Penang Island Structure Plan, 1970).

BRIEF HISTORY OF PENANG ISLAND'S LAND USE PLANNING AND ENVIRONMENTAL POLICY

Local government in Penang Island, in theory, began in 1857, when Act. No. XXVII entitled "An Act for Appointing Municipal Commissioners and for Levying Rates and Taxes in the Several Stations of the Settlement of Prince Of Wales Island, Singapore and Malacca" was implemented. Before that, decisions on the lay-out of roads and allocations of land use were done on an ad-hoc basis. The promulgation of the Act provided for a more systematic improvement of roads, provisions of additional supply of water, and provision of a complete system of town drainage. In 1888, an Act (Ordinance IX) was adopted which confined Municipal Government to the town, leaving the rural districts to be administered separately. In 1976, the Town & Country Planning Act introduces for the first time a comprehensive system of Town & Country Planning and the system is still being adopted until now.

The Environmental Quality Act 1974 paved way for the protection of environment from various human induced activities. Until the year 2002, there was no National Policy on the environmental issues. The Policy was issued by the Ministry of Science, Technology and Environment in 2002, despite the statement on formulating a national policy made by the Government of Malaysia to the United Nations Commission on Sustainable Development Fifth Session on the 7-25th April 1997 in New York.

THE PUZZLE

There are several key issues which causes land management problems in Penang Island; (i) The city is old and land policies practiced previously were often difficult to replace or modify; (ii) Conflicts between redevelopment and conservation; (iii) Conflicts between modern technology and cultural heritage and traditions; (iv) Frequently changing demands for residential developments; (v) High expectations of the populace for an improved quality of life, such as better infrastructure and security, as well as improved recreational facilities; (vi) Non commitment and fragile cooperation from various agencies involved in the land use development.

The planning of an area, particularly an area at the level of the local authority, cannot be done in isolation without taking into consideration the influences and the impacts of the strategies and growth trends at the state, national and regional levels. The Town and Country Planning Act 1976 requires that, in the preparation of the Draft Structure plan of its area, the local planning authority shall have regard to current policies in respect of the social, economic and environmental issues. Land and land use are crucial in sustainable development for a densely populated and urbanised state like Penang. Over 90% of the land has been developed for human use. Lack of agricultural land on the eastern region of the island eventually brought about land reclamation to solve land issues in early 1980's.

The facts mentioned above shows that land use development of Penang Island is being controlled by the shear pressure from scarcity of land and the development policy at the state and national level. The study identifies the following questions and tries to evaluate the feasibility of state and national Environmental Policies, and their relevance in terms of their being substantial, sustainable, and socially important.

- i. What is the nature and significant federal-state relations in terms of sustainable development policies in Penang Island?
- ii. What is the significant of national environmental policy towards sustainable development in Penang Island?
- iii. What is the degree of political will at the state level to implement the environmental polices?

These questions are especially relevant because development in Penang Island is having and will continue to have a growing national and regional impact in terms of funding and investment.

METHODOLOGY AND RESEARCH DESIGN

This study will adopt the social qualitative case study methodology covering both primary and secondary data. Generally the study involved two main stages as follows:

Stage 1: The first stage involved preparatory work to collect data for the study. This involved literature review, the primary and secondary data collection, by way of file reviews, interviews, and observation. The information obtained from the various data source will triangulate and validate the data, the finding and the suggestions.

Stage 2: The social research methodology: the methodology used was qualitative methodology rather than quantitative methodology on the reason that the researcher intend to do an in-depth and a detailed case study of certain LUP on development projects and its impact on environmental policy. In addition, as the nature of the research is of a case study, it warrants the qualitative approach is employed. Qualitative methodology is concerned with exploring development and environmental policies, histories or everyday behaviour that quantitative research is unable to grasp. Quantitative methodology, on the other hand, limits the information that certain sources could offer. The weakness of the quantitative methodology is that, it is subject to limited variables set out at the outset of the research (Silverman, 2000, pp. 2, 14, 89). The research design chosen is that of the case study. Such a design is preferred when question like “how is this happening?” and “why is this happening?” are asked, as is the case here.

CASE STUDIES

Two case studies were chosen because the vast contrary of land uses planning both places. The First Case Study is an industrial zone; on the other hand the Second Case Study is an elite residential and commercial estate.

Case Study One: Bayan Lepas And Bayan Baru, Penang.

History of land use development at Bayan Lepas started around 1820, mangroves area were reclaimed for planting paddy. Until the late 1960's the area were a mangrove fringe with paddy fields and some fishing villages along the rivers such as Nibong, Jawa, and Batu Maung rivers. Then in 1969 the federal and state government decided to develop the area to be the one of the most important industrial hub in the country. Then Penang Development Cooperation was formed and 26th June 1970 marked a historical moment for Bayan Lepas because the first ever factory was established. Later Bayan Lepas became Free Trade Zone attracting giant players in industrial world such as Hewlett Packard, Intell, Robert Bosch, Siemens Penang, National Semiconductors and many others. The study area which is about 45mins drive from Georgetown is located at the southern east of Penang Island. To date Bayan Lepas has an International Air Port and Free Trade Zone which has about 100 factories in each of its five phases and with a population of 250,000 people (Raman, 2008).

Case Study Two: Tanjung Tokong, Penang

History of Tanjung Tokong shows, the land settlement begun in 1749, when a Muslim religious teacher named Tok Guru Haji Hassan Fusanah, started a traditional village. The tombstone of Tok Guru Hassan is sited at the Tanjung Tokong cemetery. Since this settlement was pre-colonial on the sea front, there was no attempt to procure titles.

Pushed by rapid urban development of the eastern seafront of the Island at Gurney Drive, Kelawai and other fishing areas of Kampung Gigi Air, more Malay fishermen settle at Kampong Tanjung Tokong in the 1820's. From 1820-1920, Areas of Bagan Jermal adjacent to Tanjung Tokong are developed by Chinese entrepreneurs. A Taoist seaside temple is constructed at Tanjung Tokong. Wealthy Malays move out of Tanjung Tokong, Bagan Jermal and Pantai Molek as more Chinese merchants buy land in this area. Malays become a cultural minority. The only Malays who continue to live here are fishermen, labourers, teachers and vendors. Features of a coastal Malay community remain-mosque, school, fishing boats, fishermen's rest huts and wharfs. Fishermen from Kedah begin to settle at Tg. Bungah and Batu Feringghi and the local Malay population moves northwards to the Northeast Coast at Batu Feringghi. All along the Northeast and Southeast Coasts, Malay fishing villages, Kampung Gigi Air are the landmarks of an Island populated before the coming of Captain Francis Light in 1786. In 1871, it was estimated that there were 61, 797 people on the island, out of

which 70 per cent were Malays and 10 per cent Tamil Muslims. Of these Malay Muslims, 322 were Arab of Hadrami origin. Of these Malays, more than 80 per cent were coastal dwellers.

Meanwhile in 1903, Europeans begin to develop an interest in the Northeast Coast and formed the Penang Swimming Club. Missionaries develop missions on coastal and hill tracks of Tanjung Bungah. Seaside bungalows are built along the Northeast Coast. In 1910, a wakaf mosque is built at Tanjung Bungah for the fishing community and in 1921 Hafiz Ghulam Sarwar, the first Sunni Muslim to translate the Qur'an into English, gives a special mention to Tanjung Tokong and Tanjung Bungah in "The Word of God and the Wonders of Science" published in *The Muslim* 1929 (13-14). He describes turtles laying eggs on the shores. "Malay women scout the sandy shores and when they see a turtle laying eggs, they sit down and watch. When the poor creature has retired into the sea, the keen-eyed fisher-women dig up the sand and triumphantly carries her basketful to the market... Life is indeed a struggle, a jihad ..." (Lim, 1986).

During the Japanese occupation and until their surrender in 1945 created a surge in Chinese residents from George Town moving into this area, at first to protect their families from atrocities and later to establish retail businesses. Later residents of Tg. Tokong was offered temporary occupation license. The British Government then in 1954 uses funds from the Muslim and Hindu Endowment Board to reclaim the frontal portion of the shores where the derelict houses are now located. This includes 54 acres of seafront land built through natural reclamation.

In 1974, the federal government decided to develop Tg. Tokong through the Urban Development Authority (UDA). Thus, the state government transferred 48 acres of the land for a token USD0.030. Land titles were issued to 6 lots in Tanjung Tokong town; lots 253,339, 340, 341, 859, 860. UDA was given the mandate to develop Tg. Tokong. Early 1980's and until 2008 Tanjung went through major changes due to development process. Table 2 describes the impacts of the change at Tanjung Tokong.

DISCUSSIONS AND CHALLENGES

Malaysian Institute of Planners of Northern Branch (MIPNB) chairman Tan Thean Siew, had highlighted that many on Present Development Plans, Control Policies and Guidelines; some basics for review that many of the development plans, control policies and guidelines are outdated and unsuitable. Penang Island has various policy related to land use development and environmental resources development. This policy has been embedded in various development reports and master plans. Until 1990 little emphasis were given to the importance of sustainable development on the environmental issues. Even, there were provisions to safe guard the environment for the future generations, it worked on ad-hoc basis and side-lined by the interest of the economic activities. The Report of the Malaysian Institute of Economic Research of 1990 and Implementing the Brundtland Commission in Malaysia concluded that "the development process generally has not paid too much attention to environmental issues." The Report noted that "the focus on development planning has been on formulating a plan for economic growth, mobilizing the resources to achieve the growth targets and, especially over 1970-1990 period, on equity and redistribution in the Fifth Malaysia Plan (1986-1990) were environmental issues given some attention." The Sixth – Tenth Malaysian Plan discusses environmental issues in length but lacks behind proactive measures.

Legal framework

Although by the end of 1970s, the number of environmental protection legislation had grown enormously, nevertheless it was unable to curb soaring environmental problems due to modern industries and technological advancement. The reason was probably because much of the legislation was not originally designed to address core environmental problems but was passed to address specific instances as they arose from specific activity or forms of development. Thus, it is not surprising to observe that all legislation enacted prior to 1974 was largely sectoral in nature focussing on specific areas of activity. These legislation failed to adopt any integrated approach and unable to cope with the ever increasing and complex environmental problems of the modernization of the nation.

The government's decision to enact comprehensive environmental conservation legislation culminated in the passing of the Environmental Quality Act 1974 ("EQA 1974"). The Department of Environment ("DOE") is the principal agency entrusted to administer the Act. The EIA Order 1987 was introduced to ensure the activities prescribed in the schedule to the EIA Order 1987 conduct an environmental impact assessment ("EIA") process for prescribed activities. The EIA process is intended to influence the decision maker in deciding whether or not a land development project should be permitted based on the information supplied by the project proponent seeking to obtain planning

permission for a development project. The EIA process also provides avenues for public participation in the decision making process.

The major problem within the legal framework is in its sectoral approach in managing the environment. This approach appears to create problems such as leaving certain grey areas unregulated due to the overlap between existing government agencies entrusted to manage environmental issues. The sectoral approach has resulted in passing of a big number of environment related legislation each with its own provisions relating to enforcement. This framework is void of any provision for coordination between various organisations and individuals involved in the various aspects of environmental protection. The need for coordination is essential as it is only with coordination that can cause the evolution of uniform application of the law and creating uniformed environmental management standards.

Furthermore, the influence of colonial resource management system and laws that were primarily concerned with resource allocation and exploitation, dictated by the policy of maximising natural resource exploitation is still not fully eradicated. Thus, the reason for the enactment of separate laws concerned with the use of these resources rather than with sound management for sustainability.

FEDERAL AND STATE JURISDICTIONAL ISSUES

The Federal Constitution of Malaysia, 1957 (“Federal Constitution”) gives substantial powers over land use and natural resource management to the respective States. In the context of a Federation like Malaysia where there exists a complicated relationship between the federal government and state authority, the legislative framework for environmental management is very complex. According to article 74 of the Federal Constitution, matters relating to land, rivers, forests, local government, and town and country planning are within the jurisdiction of the respective State Authority. The State Legislative Assembly has powers to make laws on matters relating to the items listed in the State List in the Federal Constitution. State laws on matters relating to soil, water, or forestry often lack uniformity. This causes weakness in several areas of environmental legislation. The states usually have little incentive and rarely relinquish control over issues relating to land, mines and forests to the Federal government, or to acquiesce in the application of the federal legislation. The Federal Government has the power to make laws in respect of all matters listed in the Federal List and the Concurrent List. However, the Federal Government can introduce laws on state matters at the request of the state legislative assembly or for purposes of ensuring and promoting uniformity between the laws of two or more states. Subject to the inhibitions imposed by the Federal Constitution on the powers to legislate on matters relating to State jurisdiction, the post-independence federal environmental legislation was fragmented and related only to enactments such as forestry management, wildlife protection, and offshore hydrocarbon development.

OVERLAPPING FUNCTIONS BETWEEN ENVIRONMENTAL AND PLANNING AGENCIES

Challenges arise in relation to the competence of the various national agencies responsible for the natural resource sectors. The Department of Environment (DOE), which implements the EQA 1974, is largely responsible for industrial pollution control. The vast natural resource sectors like forestry, fisheries, mining and agriculture come under the jurisdiction of other national ministries, with separate sets of regulatory laws. The policy stance where ministries are charged with promoting development within their own respective sectors, without necessary coordination with other government agencies endowed with similar task appears to be detrimental to the environment. That is so for or at least these ministries become sensitively over protective of their powers.

There are problems of overlap in prescriptive and enforcement jurisdiction, since environmental concerns often cut across numerous natural resource sectors and environmental regulation is organised. The overlap in the jurisdiction is evident in relation to implementing the regulation for the prescribed activities under the EIA Order 1987. The list of the prescribed activities requiring an EIA report embraces issues ranging from industry and other infrastructure projects to agriculture, land reclamation, fisheries and forestry. The DOE assess the EIA report for a land development project and makes recommendations as to whether the development is to be permitted or refused. A planning authority can consult any authority, department, person or body before determining an application for planning permission. However, they are not required to strictly follow the opinions of other authorities. The planning authority may choose to ignore the recommendations of the DOE and

other government agencies. The Town and Country Planning Act 1976 (Act 172) provides that in determining planning applications, the planning authorities are required to take into consideration all aspects necessary for proper planning, including the directions given by the State Planning Committee. The State Planning Committee can request for the approval of an application for planning permission to be considered for purposes of economic development even if such projects may contradict with the policies in the development plans.

CHARACTERISTICS OF THE CIVIL SOCIETY

The cultural characteristic of the Malaysian people is another factor that cannot be ignored as it assumes a crucial role in the way environmental rules and regulations are being enforced. Malaysians are known to suppress their inner feelings in order to avoid criticism, conflict, disagreement and controversy in conducting all interpersonal relations in a smooth and unthreatening manner. The Southeast Asian style of dealing with unpleasant or dangerous situations is avoidance and silence, repressing emotions with the hope that the problem will disappear if matters are smoothed over. Malaysians failed to realise that environmental protection is not a matter exclusively to be dealt with by the government, but a matter that requires full social participation to ensure successful results.

It is important for the public who are the beneficiaries of any ill effects of poorly planned development to be given an opportunity to participate in the decision making process. Providing access to information for the public is also important as it is not possible to comment on any proposed development activity without relevant information. This is tied closely to the issue of transparency and accountability on the part of the administrative bodies empowered to implement the environmental protection measures.

LACK OF RESOURCES

Enforcement of environmental law heavily relies on the allocation of resources in terms of personnel and funding necessary to carry out the enforcement functions. For instance there is little point in employing a deterrence style of enforcement if there are insufficient personnel to investigate and prosecute offenders. Shortage of skilled and experienced professionals in both the public and private sectors is a common phenomenon in Malaysia as in most other developing countries. The planning and environmental department officials trained in the physical, biological and social sciences, needed to implement the environmental protection techniques, are not available. Most officials from environment related departments including the Town and Country Planning Department and the DOE often lack sufficient expertise to vet the Development Proposals and the EIA reports submitted by the applicants seeking for grant of planning permission. Despite the realisation of the importance of monitoring compliance of the EIA process, it is lacking due to lack of personnel and increasing numbers of newly approved development projects.

CONCLUSION

Environmental resources have played a key role in supporting the nation's socio-economic development. There is need to ensure that these land use development and other environmental resources such as soil are conserved and managed wisely to ensure sustainable development, and that the depletion of natural resource is taken fully into account in development planning. Present high economic development rates do not take into account natural resource depletion, and therefore such development places great strain on the environment. In the Malaysian context, therefore, economic growth over the next decade and into the next century will need to be by alternative strategies if the quality of human life is to be improved within the carrying capacity of supporting ecosystems, without compromising the ability of future generations to meet their own needs. This is the trade-off to ensure that development is unsustainable over the longer term.

The present policies and guidelines need to be reviewed and should be done on a careful basis. A first step is to discover the original intention and purpose of each of the control policies and guidelines, examine how situations have changed and they are still relevant.

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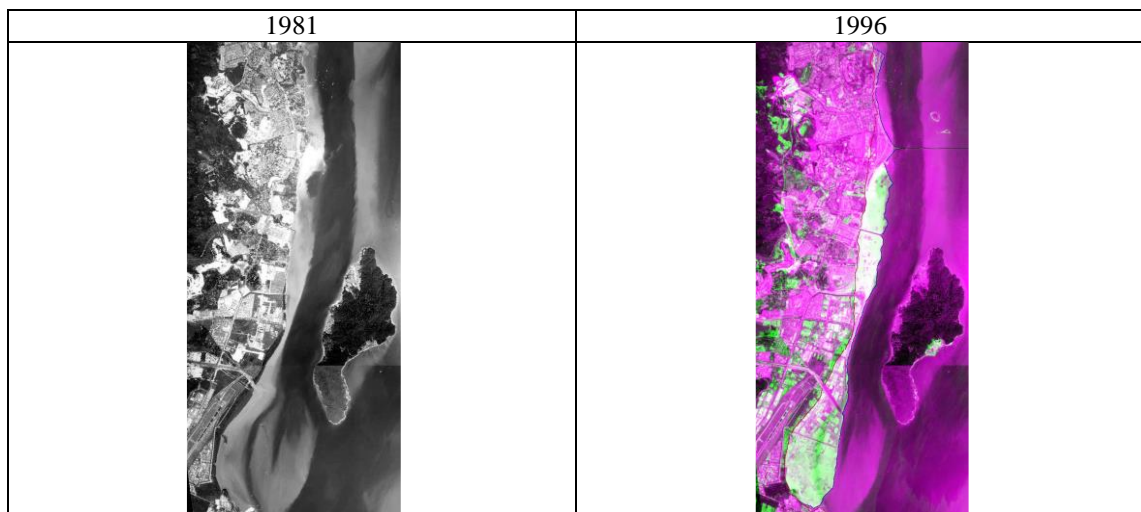
TABLE 1: Impacts of Development Policies on Economy and Natural Environment at Bayan Lepas, Penang.

Items	Development Policies
Before 1970's	First Malaysian Plan, Second Malaysian Plan
2010	Third Malaysian Plan, Fourth Malaysia Plan: Regional and Urban Development, Privatization, Malaysia Incorporated, The Look East Policy, Industrial Development Policy, Fifth Malaysian Plan, Sixth Malaysian Plan, Seventh Malaysian Plan, Eight Malaysian Plan: The First Penang Strategic Development Plan, The Second Strategic Development Plan, Ninth Malaysian Plan, Tenth Malaysian Plan, New Economic Policy,
Economy Impact	Attracted FD 100-500 billion USD, Created 100,000-250,000 workforce,
Environmental Impact	National Environmental Policy was introduced in 2002
Items	Natural Vegetation
Before 1970's	Mangroves, wet land, hilly forest
2010	None
Economy Impact	More space for factories, business centers, recreational clubs
Environmental Impact	Replaced with modern landscaping Fail to sustain the mangrove forest at Bayan Lepas
Items	Coastline
Before 1970's	Wet Land, mangroves
2010	Coastal Expressway
Economy Impact	Modern Transportation to boost economy
Environmental Impact	Concrete Bund to protect the Coastal Highway Lost of mangroves species, migratory birds
Items	Land use
Before 1970's	Rice fields
2010	None
Economy Impact	Industrial Estates, Housing Estates, Shopping Complex.
Environmental Impact	Traffic Congestion, Degradation of air & water quality Frequent flooding and flash floods
Items	Build up area

Before 1970's	Less than 10% mostly wooden houses
2010	85% of new townships
Economy Impact	Wooden houses were replaced with modern homes, apartments, condominiums, Shop lots, Schools etc.
Environmental Impact	Produces more waste from domestic usage Needed more waste disposal facilities
Items	Water bodies
Before 1970's	5 rivers & few streams
2010	Rivers are merged into two Canals and Monsoon drains These water channels fail to sustain the water volume during rainy season and resulted in frequent flooding's
Economy Impact	Traditional livelihood i.e. Fisherman
Environmental Impact	Discharge of effluents from industries
Items	Factories/ Industrial Zone
Before 1970's	Cottage industries involved in processing paddy, fish etc.
2010	Five Free Trade Zones, each comprising 100 factories Multi-National Companies producing Electronics and electrical parts
Economy Impact	Attracted investment totaling more than 500b USD Created more than 500,00 employment opportunity
Environmental Impact	Industrial waste which discharged directly into the sea Degrading water quality
Items	Utilities
Before 1970's	Road, Airport (International)
2010	Four Lane Coastal Expressway, New Airport (International), Penang Sports Complex, Biggest Shopping Complex in the Island, New Hospital, International Hotels, Private School, Five New Secondary School, Golf course, Recreational Club, High Rise apartments,
Economy Impact	To cater the increasing population due to industrializations
Environmental Impact	Traffic congestions Increasing incidents of air pollution and water pollution
Items	Settlements
Before 1970's	Small town, traditional villages and fishing villages
2010	Two new townships, 25 housing estates, 30-40 apartments buildings
Economy Impact	Increasing land prices
Environmental Impact	Loss of natural habitat such as streams, permanent forest
Items	Population/Density
Before 1970's	5,000/ 50 per km
2010	250,000/1500 per km
Economy Impact	Created more work force: skilled, semi-skilled and general workers
Environmental Impact	Total traffic volume per day is about 120,000-150,000 contributes air pollution. Total volume of solid waste increased by 200%. Capacity of sewerage facility only for 150,000 but need to service increasing population
Items	Live hood
Before 1970's	Farmers (60%), Fishermen (30%), Government servants (2%), groceries business (5%)

2010	Factory Workers (65%), Business (20%), Government servants (10%), Fishermen (3%), Others (2%).
Economy Impact	Increasing purchasing power Enhances usage of sophisticated technology Encourages modern living
Environmental Impact	Increase of Sewerage problem
Items	Income per capita
Before 1970's	100-150 USD
2010	1500-2000 USD

Source: Interviews, Surveys (2010)



Source: Raman,2004

FIGURE 1 : Land Reclamation and Change of Natural Vegetation Along Bayan Lepas, Penang Between 1981 and 1996

TABLE 2: Development Policies Impacts on Economy and Natural Environment at Tg. Tokong Between 1980 and 2010

Items	Development Policies
Before 1970's	First Malaysian Plan, Second Malaysian Plan
1970 - 2010	Third Malaysian Plan, Fourth Malaysia Plan: Regional and Urban Development, Privatization, Malaysia Incorporated, The Look East Policy, Industrial Development Policy, Fifth Malaysian Plan, Sixth Malaysian Plan, Seventh Malaysian Plan, Eight Malaysian Plan: The First Penang Strategic Development Plan, The Second Strategic Development Plan, Ninth Malaysian Plan, Tenth Malaysian Plan, New Economic Policy,
Economy Impact	Attracted 30 million USD, Created 20,000-30,000 workforce,
Environmental Impact	
Items	Natural Vegetation
Before 1970's	Mangroves, Wet land, Pockets of beaches
2010	None
Economy Impact	More space for residential and commercial centers
Environmental Impact	Replaced with modern landscaping Fail to sustain the wet land
Items	Coastline
Before 1970's	Wet Land, mangroves

2010	Paved and concrete walk, roads
Economy Impact	Recreational activities
Environmental Impact	Concrete Bund to protect the road Lost of species fish & migratory birds
Items	Land use
Before 1970's	Fishing villages
2010	High rise apartments, condominiums, shopping centers, service centers, commercial centers
Economy Impact	Housing Estates, Shopping Complex.
Environmental Impact	Traffic Congestion, Degradation of air & water quality Frequent flooding and flash floods
Items	Build up area
Before 1970's	Less than 10% mostly wooden houses
2010	95% of new townships
Economy Impact	Wooden houses were replaced with modern homes, apartments, condominiums, Shop lots, Schools etc
Environmental Impact	Produces more waste from domestic usage Needed more waste disposal facilities
Items	Water bodies
Before 1970's	2 rivers & few streams
2010	Rivers are merged into one monsoon drain
Economy Impact	Recreational & Commercial beach marinas
Environmental Impact	Pollution from sewerage
Items	Settlements
Before 1970's	Small town, villages and fishing villages
2010	A new township, 10 housing estates, 10-20 apartments buildings
Economy Impact	Increasing land prices
Environmental Impact	Lost of natural habitat such as streams, permanent forest
Items	Population/Density
Before 1970's	5,000/ 50 per km
2010	150,000/2500 per km
Economy Impact	More employment opportunities
Environmental Impact	Increase of vehicle produces more pollution: air, waste disposal from domestic, business premises, workshops etc.
Items	Live hood
Before 1970's	Fishermen (80%), Farmers (10%), Government servants (5%), groceries business (5%)
2010	Professionals 45%, Government 25%, Business 20%, Fishermen 5%, Others 5%
Economy Impact	Increasing purchasing power Enhances usage of sophisticated technology Encourages modern living
Environmental Impact	Increase of Sewerage problem
Items	Income per capita
Before 1970's	120-150 USD
2010	1000-1700 USD

Source: Interviews, Surveys (2010)



Source: Raman, 2008

FIGURE 2 : Changing Coastline Due To Natural and Man Induced Coastal Activities Between 1960 and 2010