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Using Index to Measure and Monitor Progress on Sustainable Development

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1. Introduction

Since sustainable development of a country or a region has received more and more attention recently, many countries and regions have implemented policies to ensure or protect sustainable development. For this reason, it is necessary to develop approaches to measure and monitor both the effectiveness of these policies and the progress made on sustainable development in different regions. To achieve this goal, some countries or regions have developed their own sustainable development index (SDI). On the one hand, for the country or the region itself, SDIs can provide objective information and act as a tool for assessing performances, evaluating progresses, predicting future trends and identifying priority areas in formulating policy and decision-making. On the other hand, governors and scholars also need SDIs to make comparisons of sustainable development among countries or regions, considering multidimensional variables, such as economic, environmental and social variables.

Nowadays, there are different ways of measuring sustainable development which basically depend on the specified objectives of the study. One approach is to construct a SDI based on official statistics to provide an objective measure. However, this approach cannot reflect directly the opinions and feelings of the people living in the study region. Another approach is by conducting a survey. This alternative can measure the views from different sub-group population and produce indicators that can compare the sentiments amongst the sub-group population.

The main challenge of measuring sustainable development is to identify policy areas, while the underlying problem is to identify and prioritize local community's concerns and issues regarding sustainable development. In this chapter, a method of how a multi-stakeholders engagement process was applied to achieve the target is illustrated. A systematic methodology of using index to measure and monitor progress on sustainable development is also constructed after identifying priority areas. The city of Hong Kong is used as a case study to show these approaches in detail. This chapter unfolds as follows. Section 2 reviewes the relevant literatures to introduce significant issues and examples of constructing SDI at both national and regional levels. Some development millestones of SDI for Hong Kong is also included in this section. Section 3 introduces these factors often used in measuring sustainable development. The method of identifying priority areas is described briefly, and then how Hong Kong determines priority areas through this method is

discussed to show operation details. Section 4 talks about the survey scheme adopted to collect the data and the structural equation modeling techinque employed to estimate the Hong Kong sustainable development index (HKSDI). Section 5 summarizes the key findings from the survey. Section 6 discusses reasons of importance and performance data for some priority areas through analyzing those key findings. Conclusions and limitations of the framework are shown in Section 7.

2. Literature review

2.1 Examples of developing SDI at national level

Wackernagel and Rees developed a calculation model for the environmental footprint, which was used as a world-recognized indicator to monitor the impact of global environment to our actions and assess the sustainability of different nations (Wackernagel & Rees, 1997).

In 1996, the United Nations (UN) Organization listed 134 indicators relevant to sustainable development to help these countries monitor their development conditions and implement efficient policies to ensure the sustainable development at national level (Division for Sustainable Development, 2001).

The UN set out the United Nations Development Programme (UNDP) in 2000; the United Nations millennium declarations and millennium development goals were also formulated in that year, which aimed at making sure that human development would reach everyone and everywhere. A human development report for UNDP was published in 2005, which was about the scale of the challenge facing the world at the start of the 10-year countdown to 2015 (Charlotte, 2005). The UNDP focused on three pillars of cooperation, each in urgent need of renovation. They were developing assistance, international trade and security. They also constructed the human development index for 177 countries as a composite indicator to provide a measure for comparing country achievements across all levels of human development.

In 2005, the United Kingdom (UK) government reviewed their sustainable development strategies which were set out in 1997, and updated these strategies according to a series of indicators in economic, environmental and social outcomes, since some of these indicators had moved very much in the right direction and they didn't adjust to development trends any more. Through these updating strategies and measurements, the UK government aimed at constantly promoting the sustainable development in UK (United Kingdom Goverment, 2005).

Barrios and Komoto proposed a SDI for the Philippines (Barrios & Komoto, 2006), in which sparse principle component analysis was used to facilitate interpretation of results. In their study, the SDI was used to indicate the areas in which improvements were required so as to achieve a better and sustainable quality of life.

Short investigated the methodologies and policies used in Rwanda, a country with a special history background, to promote and ensure sustainable industrial development and examine the government's role in providing an appropriate sustainable development framework (Short, 2008). As Rwanda's unique position presented difficulties in representing the relationship between governance and industry, Short introduced a six-dimension of

sustainability adapted from the royal academy of engineering as an analysis model to analyze those special responses from interviews.

The U.S. Environmental Protection Agency (EPA) reported the most reliable indicators currently available to answer key questions about trends in human health and the condition of the nation's environment (EPA Project Team, 2008). The EPA also demonstrated the importance of scientifically sound information to help people understand the state of the environment, identify areas of concern, and monitor progresses.

2.2 Examples of developing SDI at regional level

Although SDIs at the national level are important as lots of powerful decisions are made at this level, SDIs at the regional level are also needed, since for many countries, especially for those large ones or small ones with various diversities, indicators at the national level may mask the sustainable development performance at the regional level. Hence, SDIs at the regional level with indicators adaptable to the local condition are developed.

The organization Sustainable Seattle presented a report to citizens of Seattle on long-term trends in the community (Sustainable Seattle, 1993). The indicators of the sustainable community covered four aspects: environment, population & resources, economy and culture & society. The organization presented these indicators to alert the people of Seattle to learn the problems they faced and got them involved in finding solutions to those problems.

Hoffman developed the roots index as a measure of local sustainable development in New York City for the years 1990-1995 (Hoffman, 2000). The index focused on the foundations of sustainable economic activities and factors that had long-term impacts, such as education, health, housing, infrastructure, environment, access to the legal economy and equality of opportunity, each belonging to one of three UN sustainability categories: social, economic, and environmental. The roots index results also revealed several areas of future problems for the New York City.

Herrera-Ulloa et al. proposed a methodology to evaluate sustainable development within defined regions (Herrera-Ulloa et al., 2003). They developed a regional-scale SDI for Baja California Sur (BCS) of Mexico through the principal component extraction and factor analysis, taking into consideration the social, environmental, economic and institutional dimensions with 27 indicators. The SDI not only reflected an integrated measure of overall sustainability for the BCS region, but also was helpful for developing policies and strategies to obtain better sustainable development conditions.

Ledoux et al. presented an overview of a set of sustainable development indicators recently adopted by the European Commission to monitor, assess and revise the sustainable development strategy adopted in Gothenburg in 2001 (Ledoux et al., 2005). It introduced a hierarchical theme framework based of the policy priorities of the sustainable development strategy to contribute to efficient choosing of indicators, and placed energy and climate change issues in a broader perspective.

2.3 Millstones of developing SDI in Hong Kong

The city of Hong Kong, which is a special administrative region of China after 1997, has an increased awareness of the need for continuous growth and sustainable development.

For China, the sustainable development was set up in 1992 after the holding of Rio Conference on environment and development. Referring to China's Agenda 21 in 1994 (Department of Planning Committee of China, 1994), the Department of Planning Committee of China published a series of plannings, targets and policies of sustainable development, considering China's population, environment and development in the 21st century. The agenda divided policies into three dimensions, they were sustainable social development, sustainable economic development and rational utilisation of resources & environmental protections. Since then, the sustainable development has been a main topic at both national and regional levels in China. In 1999, the Chief Executive of Hong Kong stated in his Policy Address an endeavor to building Hong Kong into a world-class city. Making Hong Kong a clean, comfortable and pleasant home requires a fundamental change of mindset. Every citizen, business, Government Department and Bureau needs to start working in partnership to achieve sustainable development. In simple terms, sustainable development for Hong Kong means finding ways to increase prosperity and improve the quality of life while reducing overall pollution and waste; meeting our own needs and aspirations without doing damage to the prospects of future generations; and reducing the environmental burden we put on our neighbors and helping to preserve common resources. Since 2000, a social development index has been developed by the Hong Kong Council of Social Services. Corresponding reports are published bi-annually since then.

Chiu preliminarily assessed the overall environmental sustainability of the existing housing system of Hong Kong and the usefulness of Bhatti's building life-cycle model in developing a policy for sustainable housing development (Chiu, 2000).

Chiu applied the sustainable development perspective to investigate whether policy changes and government responses to the collapse in the property market have made the distribution and consumption of the resources in Hong Kong more equitable (Chiu, 2002).

Robert and Hills discussed the sustainable development of Hong Kong and Scotland by considering the impact of changing circumstances (Robert & Hills, 2002).

Hills discussed the recent evolution of environmental policy in Hong Kong, the emergence of a regional environmental management agenda and the potential of ecological modernization (Hills, 2002). They were used as a basis for the development of a broader strategy to manage the environmental problems of the Pearl River Delta Region.

Lai et al. discussed a Coasian interpretation of a model of sustainable development for Hong Kong that incorporated economic, societal and environmental factors (Lai et al., 2006).

Chua et al. summarized the current state of social development in Hong Kong, based on the Social Service Index 2008, and identified the major social, political and economic challenges that were confronted by Hong Kong (Chua et al., 2010). They also discussed a range of policy options proposed for promoting a more balanced approach to social and economic development.

While progress has been made in raising public awareness of sustainable development, the fundamental change of mindset has yet to occur. The government formed the Sustainable Development Council in April 2003 to lead the development strategies in Hong Kong. The Council has developed strategies for addressing the specific issues of waste management,

urban planning and renewable energy, with new strategies for population policy and air quality through public consulation.

These are positive setps, but what is needed is a holistic strategy to address the diverse yet interconnected issues that will further enhance the sustainability of Hong Kong, not a set of strategies on individual topics. To get a clearer picture of areas to be improved, however, Hong Kong needs an effective way to measure its quality of life. For this reason, the HKSDI has been designed and launched in 2003 based on the 10 priority areas that represent a wide range of community concerns in relation to the local economy, social progress and the environment(Tso et al. 2011). The construction of HKSDI can reflect a wide range of economic, social and environmental issues that are relevant to Hong Kong and track the public's view on Hong Kong's progress toward a more sustainable future.

3. Factors included in measuring models

3.1 Introduction of factors

Analyzing those examples of developing measurement on sustainable development reviewed in the foregoing section, we find that development problems faced by different countries or regions could be diverse. For these countries and regions, it is often difficult to figure out the areas of major concern, when it comes to putting sustainable development into practice. So in order to get a clear picture of areas to be improved and a holistic road map to improve the quality of life in the region, we need sustainable development indicators to influence behaviors, assist in the design and implementation of improvement programs and enable progress to be monitored.

Referring to the UN's report in 2007 (Department of Economic and Social Affairs, 2007), at the international level, the United Nations Commission on Sustainable Development (CSD) published the first edition of CSD indicators set in 1996, including 134 indicators. During 1999 to 2000, some countries tried to test this indicator set, and they found that this CSD indicator set was too large to be easily managed. So the CSD revised the set, drastically reducing it into 58 indicators, embedded in a policy oriented framework of themes and sub-themes. With evolving of the world, some countries had developed their own indicator set based on the CSD indicators. In 2005, the United Nations Division for Sustainable Development (DSD) decided to review the second edition CSD indicaton set, and they announced the third, revised set of indicators of sustainable development prepared for CSD in 2006. The newly revised CSD indicators contained a core set of 50 indicators, which were part of a larger set of 96 indicators of sustainable development. Instead of using division of indicatiors through "four pillars" (social, economic, environmental and institutional), the newly indicator set was placed into a framework of theme and sub-themes. These indicators belong to 14 themes, which can continuely be divided into 44 sub-themes. The theme details are poverty, governance, health, education, demographics, natural hazards, atmosphere, land, oceans, seas and coasts, freshwater, biodiversity, economic development, global economic partnership and consumption and production patterns.

Fig.1 shows the concept of sustainable development disscussed in the 2nd Kyoto International Seminar on Sustainable Growth in the Asia-Pacific region. The sustainable development is the integration of economic, social and environmental dimensions. Although multidimensional variables are always involved in developing sustainable

development indexes, and those newly CSD indicators had inter-thematic linkages, we still can classify these common themes into three catalogs namely economic, environmental and social factors according to this integration. Fig.1 also gives us a direct simple classfication of those themes mentioned in CSD indicators set. Natural hazards, atmosphere, land, oceans, seas and coasts, freshwater and biodiversity are often measured as environmental factors. At the same time, economc development, global economic partnership and consumption and production patterns are grouped as economic factors. Poverty, governance, health, education and demographics are considered as social factors.

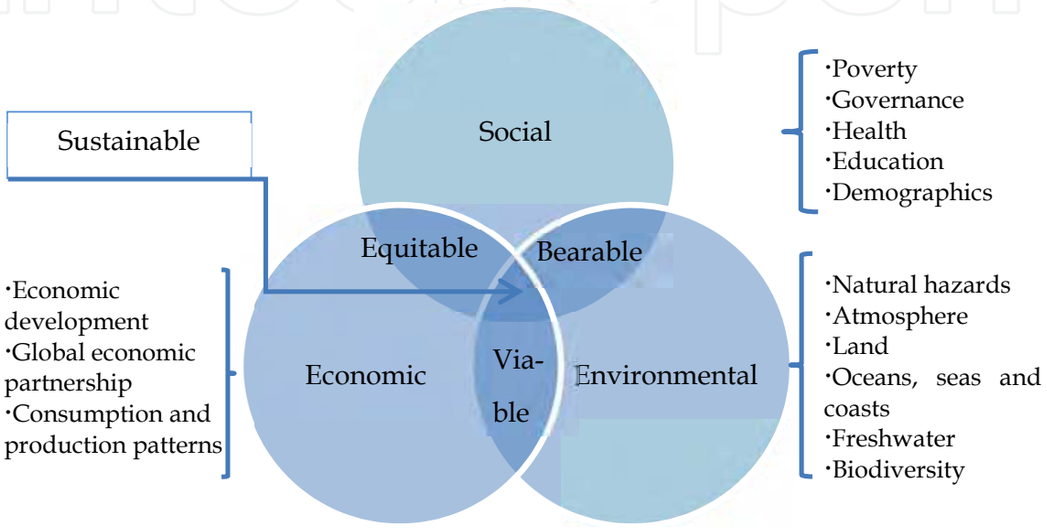


Fig. 1. Sustainable Development

In the construction of SDI, it's not necessary to include all variables in each catalog. Some SDI measuring models cover all three kinds of factors (e.g. Ledoux et al., 2005), most models integrate at least two kinds (e.g. EPA Project Team, 2008) and a few models specialize in only one aspect (e.g. Wackernagel & Rees, 1997). Referring to the work of Ledoux et al. in 2005, of the indicators designed for communication with the general public, 34% integrate three kinds of factors, and 86% address at least two aspects. Hence, for different regions, the construction of SDI should depend on the local practical situation and the real problems they are facing to choose related factors.

In summary, in order to identify policy areas exactly, governors need to locate priority areas accurately, choose adaptable themes, and use indicators into measuring models. However, the CSD indicator framework was designed for monitoring sustainable development at the national level, and most measurements of indicators were official statistics, which cannot reflect directly the opinions and feelings of people living in the study region. So it would mask sustainable development performance at the regional level if the CSD indicators were transplanted directly into the construction of SDI at the regional level.

Hence, when it comes to monitoring the effectiveness of a region, we need comprehensive approaches to determine priority areas according to local sustainable development conditions, considering three dimensions of environmental, economic and social factors.

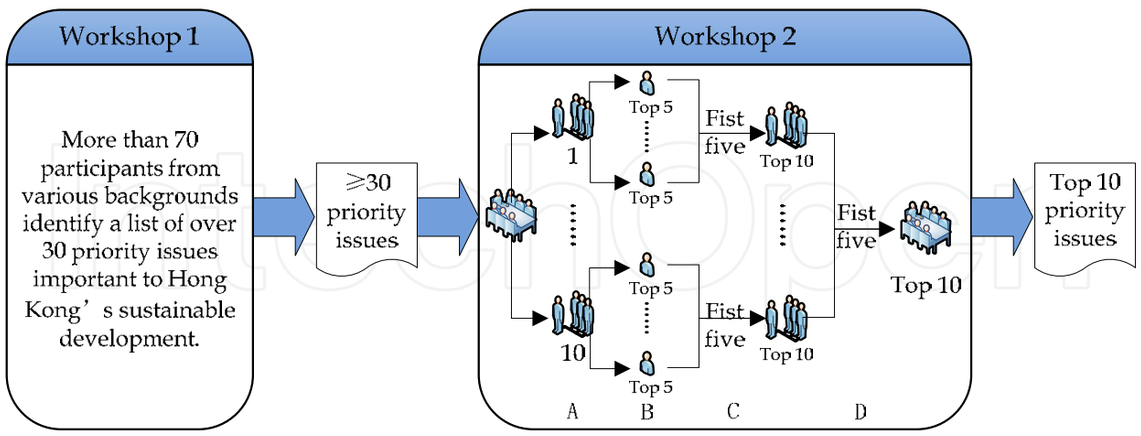
3.2 Method of determining priority areas

Considering the limitation of official statistics, a new method of determining priority areas of sustainable development was developed. This section introduces the framework of determining priority areas and explains how Hong Kong used this methodology to achieve its priority areas for the sustainable development.

The HKSDI is based on the 10 priority areas that represent a wide range of community concerns in relation to the local economy, social progress and the environment. These 10 areas were identified through multi-stakeholder engagement workshops conducted to identify priority areas for Hong Kong's sustainable development. Thus, this index can reflect a wide range of economic, social and environmental issues that are relevant to Hong Kong and track the public's view on Hong Kong's progress toward a more sustainable future.

Fig. 2 shows the method of determining the top 10 priority areas to be focused on for Hong Kong. The methodology consists of two workshops. The first one is to identify a list of priority issues which were important to Hong Kong's sustainable development, conducted by those participants who were interested in this topic. While the second one is to achieve the target top 10 priority areas used for HKSDI through an interactive consensus building process conducted by multi-stakeholders. Operation details of this method are as follows.

The first workshop conducted in 2001 involved over 70 participants interested in the topic, including government officials, business operators, environmental consultants and members from various chambers of commerce. During the workshop, particular questions like "what are your priorities for a sustainable society in Hong Kong" and "how would you define them and what targets should Hong Kong achieve" etc. were used to focus discussions on three topic areas of social, economic and environmental sustainability. As a result, participants reached consensus, through interactive and facilitated discussions, on a list of over 30 priority issues, which were important to Hong Kong's sustainable development.



Note:
A: Divide participants into 10 groups, each with ≤10 members from different stakeholder groups
B: Each member in a group identifies top 5 priorities
C: Each group reaches an agreement with a list of the top 10 priorities
D: All participants reach a consensus on a list of the top 10 priorities

Fig. 2. Method of determining the top 10 priority areas

The second workshop, which was part of the Government's International Symposium on Sustainable Development, reviewed the identified priority issues and reached consensus on the top 10 priority areas for sustainable development in Hong Kong through debates. The second workshop involved a diverse group of stakeholders who represent a variety of sectors including business, government, environmental and social organizations, academics and professionals. The goal of the workshop was to identify top 10 priority areas that participants believed should be the focus of action to further sustainable development in Hong Kong. An interactive consensus building process was used to reach the conclusion of the 10 priority areas. During the process, the workshop participants were divided into 10 small discussion groups, each comprising up to 10 members from different stakeholder groups and being led by an independent facilitator. Each small group then reviewed and discussed according to the following outlines:

1. Individuals in each group first reviewed the priorities from the previous workshop, considering the local and international context of Hong Kong's sustainability; they then selected their top five priorities.
2. Each member then shared their top 5 priorities with the group while the facilitator counted the votes of each priority.
3. Each group discussed the selected priorities in order to understand each other's views and to see whether there was an agreement on the group's selection of top 10 priorities.
4. After discussing their rationales for why a priority should be on the list or not, each group member was then asked individually to identify the top 10 priorities that he/she believed should be on the list.
5. These results were shared within each group and, however, if an effective consensus was not attained on the list of top 10 priorities, the "fist five" tool [1] was employed to show members' support for including or excluding particular priorities.
6. After reaching a consensus on the list of top 10 priority areas in each small group, all participants re-convened to share their results and to discuss ways forward to reach a consensus as a larger group on the final list of top 10 priorities. As a result, criteria were suggested to filter the priorities, and a list of top 10 priorities emerged. The "fist five" technique was used again to gauge the level of support for the final list among the participants.

At the end of the second workshop, the following 10 areas were determined to be the priority areas for sustainable development in Hong Kong, including: caring and ethical employers, civil liberties and human rights, community spirit and well-being, educational system, environmental protection, health and hygiene, healthy economy, integration with the mainland, population policy, and urban planning.

As a remark, the above method of determining priority areas of sustainable development may be criticized as subjective. However, given the resource limitations and other constraints, to conduct a large scale opinion poll to determine the priority areas is infeasible.

[1] "Fist five" is a consensus-building tool that enables group members to indicate the extent to which they support a decision, e.g. five fingers indicates unwavering support and a fist indicates absolute disagreement with the way forward. Depending on the number of fingers shown, from none to five, the group can effectively gauge the level of support for an outcome and then discuss it until the group agrees on or accepts the outcome or decision.

The current way to determine the priority areas is an attempt to strike for a balance, with an aim to systematically collect information from multi-stakeholders, which is assumed to be representative for the population's view.

4. Measurement process

4.1 Data collection

The HKSDI was developed as an indicator to reflect changes in public opinion regarding sustainable development in Hong Kong. Annually between July and September over 2,000 randomly sampled Hong Kong residents, aged 18 or above, were surveyed by telephone. Respondents were engaged in detailed conversations, usually lasting for 20 to 30 minutes, about issues that were critical to the sustainability of Hong Kong.

For each priority area, respondents were asked to indicate their ratings, using a 10-point scale, regarding the following attributes:

1. How important the priority area is for achieving and sustaining quality of life in Hong Kong?
2. Which aspect(s) of the priority area are important for improving quality of life in Hong Kong?
3. How satisfied he/she is in regard to Hong Kong's performance in the priority area?

4.2 Calculating the index

The HKSDI is defined by a weighted average of satisfaction scores of the 10 pre-specified priority areas. It has a range between 0 and 100. The relative levels of importance of the 10 priority areas were used as weights. The importance levels of the 10 priority areas were first normalized into a percentage distribution, so as to produce a summed total of one.

In particular, the computational formula of HKSDI is given by

$$\text{HKSDI} = \frac{\sum_{i=1}^{10} \overline{W_{i1}}\,\overline{P_{i1}}}{\sum_{i=1}^{10} \overline{W_{i0}}\,\overline{P_{i0}}} * 100 \tag{1}$$

$$\overline{W_i} = \frac{1}{n}\sum_{j=1}^{n} W_{ij} \tag{2}$$

$$\overline{P_i} = \frac{1}{n}\sum_{j=1}^{n} P_{ij} \tag{3}$$

where

n is the sample size;

W_{ij} is the level of importance for priority area i provided by respondent j;

P_{ij} is the satisfaction level for priority area i provided by respondent j;

$\overline{W_{i1}}$ and $\overline{P_{i1}}$ are the average importance level and satisfaction level respectively for priority area i of the current year;

$\overline{W_{i0}}$ and $\overline{P_{i0}}$ are the average importance level and satisfaction level respectively for priority area i of the base year 2003.

The specific objectives of the index are:

1. To assess the importance of sustainable development priority areas within the Hong Kong community;
2. To determine what sustainable development priority areas mean to the community;
3. To track community perceptions on the importance of sustainable development priority areas and the progress in managing these areas; and
4. To raise awareness of the important role of the priority areas in furthering sustainable development.

5. Key findings

5.1 HKSDI values and respondents' expectations

Each year an aggregated score is calculated based on the results of the survey that provides an annual measure of progress in furthering sustainable development in Hong Kong. The following table (Table 1) shows the HKSDI values from 2003 to 2007.

Year	Sample Size	HKSDI value
2003	2,501	100.0
2004	2,515	102.8
2005	2,051	102.5
2006	2,054	102.2
2007	2,021	103.7

Table 1. HKSDI values from 2003 to 2007

HKSDI values act as a quantitative measurement tool for the sustainable development. The HKSDI in 2003, which is the baseline measure, was 100. Statistically, the index values in 2004, 2005 and 2006 do not significantly deviate from each other. They were 102.8, 102.5 and 102.2 according to the time sequence. While in 2007, the overall index score was 103.7, slightly higher than 102.2 in 2006. There is an annual increase in the index from the baseline of year 2003 to the year 2007, this modest increase trend indicates that Hong Kong people perceived some progress has been made in addressing the priority areas measured by the index since 2003. So the sustainable development index can be used to measure levels and monitor progress on sustainable development.

At the same time, respondents were asked in an open-ended question to identify the aspects in each of the 10 priority areas that needed further improvement, which can be used as a qualitative monitor tool to help the stakeholders to identify specific aspects that are essential for improving performance in the priority areas, and thus contribute to improve the overall sustainable development.

The results obtained over the years reveal that for the economy, aspects such as creating employment, improving employee benefits, and trade opportunities are most important, whereas reducing air pollution, improving cleanliness of the city and establishing more open and green space are important on the environmental side. On the people side, Hong Kong people demand good teaching quality be found in schools, better immigration policy for mainland people, higher civic consciousness and care for others, as well as freedom of speech. These demands have not been changed over the past few years.

5.2 Importance of each priority

Respondents were also asked to rate the level of importance for each of the 10 priority areas which were determined through two workshps mentioned before. Along the 5-year study period, all the 10 priority areas received consistently high ratings of importance of 7 or higher out of 10. Their average scores are given in Table 2, which are graphed in Fig. 3.

Mean value in each year / Priority areas	2003	2004	2005	2006	2007
Education System	8.3	8.4	8.3	8.5	8.3
Health and Hygiene	8.3	8.3	8.2	8.4	8.2
Environmental Protection	7.9	8.2	8.2	8.4	8.3
Healthy Economy	8.3	8.1	8.1	8.2	8.0
Caring and Ethical Employers	7.9	7.9	7.9	8.0	7.9
Urban Planning	7.6	7.7	7.6	7.9	7.7
Community Spirit	7.5	7.5	7.5	7.8	7.7
Population Policy	7.5	7.6	7.6	7.8	7.6
Integration with the Mainland	7.1	7.4	7.4	7.6	7.5
Civil Liberties and Human Rights	7.5	7.5	7.3	7.5	7.2

Table 2. Average importance score of each priority area in Hong Kong from 2003 to 2007

Fig.3 shows that, from 2003 to 2007, Education System, Environmental Protection, and Health and Hygiene ranked top most important issues (except for the average score of Environmental Protection in 2003) contributing to the sustainable development in Hong

Kong. In contrast, Civil Liberties and Human Rights, Integration with the Mainland and Population Policy always ranked the least important issues (except for the average scores of Population Policy in 2004 and 2005) contributing to the sustainable development in Hong Kong.

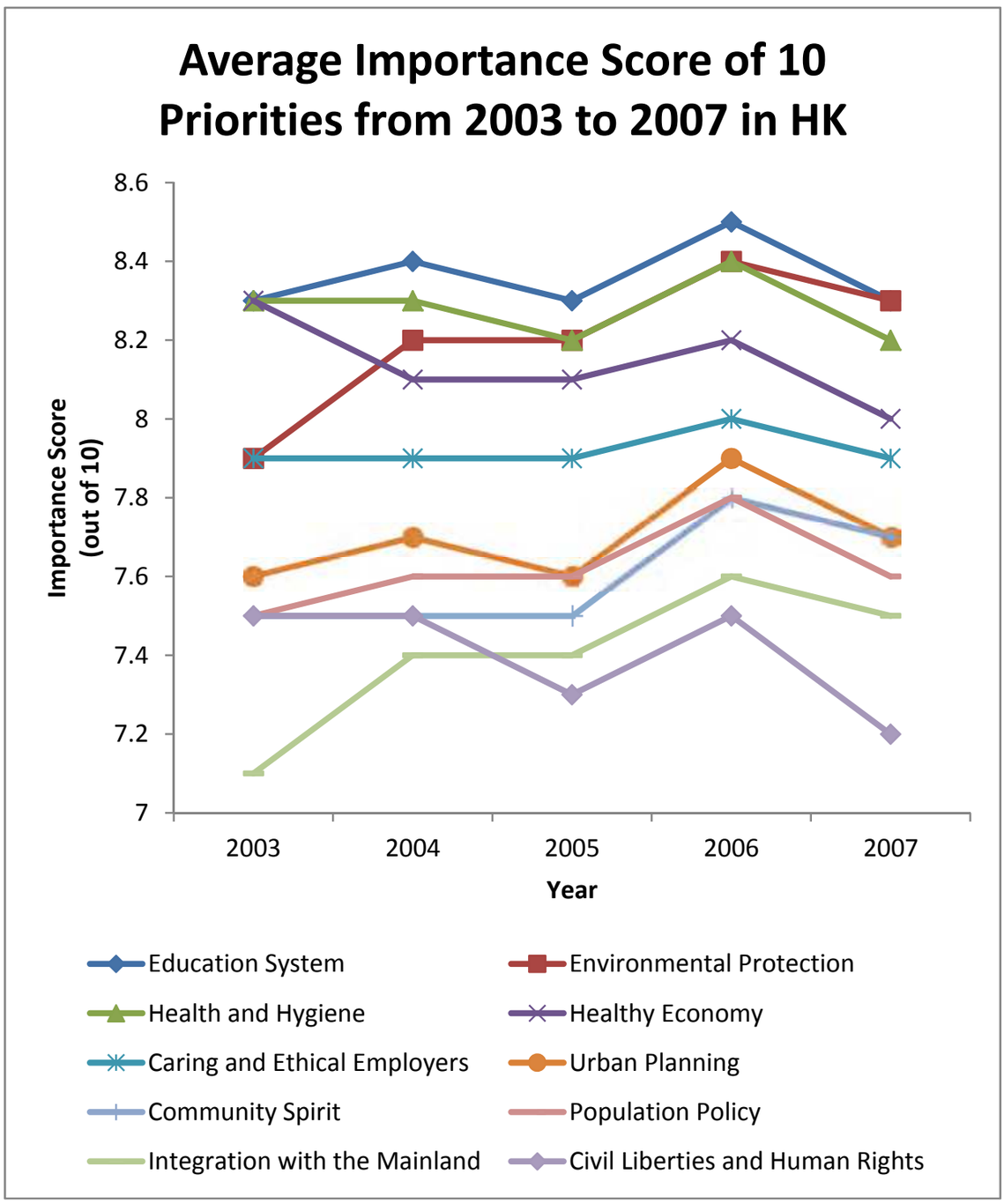


Fig. 3. Average importance score of each priority area in Hong Kong from 2003 to 2007

To further understand the trends, the "most important" and "least important" areas along the 5-year period are listed in Table 3. It is found that Education System has always been perceived the most important aspect. On the other hand, Integration with the Mainland was initially rated as the least important area, and then it shifted to Civil Liberties and Human Rights. During the growing economy period from 2005 to 2007, it is interesting to note that respondents rated Civil Liberties and Human Rights the least important aspect for sustainable development.

Furthermore, in order to monitor the possible changes in the importance ratings of the 10 priority areas along the 5-year study period, a one-way analysis of variance (ANOVA) was conducted. Here the factor refers to the year from 2003 to 2007, and the response variable is the importance rating of each priority area. Concluding that there was strong evidence that the expected values in the five groups be the same, so no significant difference (at 5% level) in the 5-year period for each of the priority areas has been found.

	2003	**2004**	**2005**	**2006**	**2007**
Most important	Education System(8.30)	Education System(8.37)	Education System(8.34)	Education System(8.48)	Education System(8.34)
Least important	Integration with the Mainland(7.12)	Integration with the Mainland(7.35)	Civil Liberties and Human Rights(7.29)	Civil Liberties and Human Rights(7.49)	Civil Liberties and Human Rights(7.23)

Table 3. Importance trend from 2003 to 2007

5.3 Performance of each priority

Respondents were also asked to rate how satisfied they were with Hong Kong's performance in each of the 10 priority areas that were important to their quality of life. Their average scores are given in Table 4, and graphed in Fig. 4.

Fig.4 shows that, from 2003 to 2007, Health and Hygiene and Civil Liberties and Human Rights always ranked top two issues in the average performance score graph. While the Healthy Economy was the unique issue which has markedly improved its performance since 2003, and satisfaction levels have remained relatively consistent for other priority areas. None of them received an average score of more than 7 out of 10 and the majority average scores were around 5.5 out of 10. In contrast with those issues which always ranked at the top, Population Policy ranked the worst satisfying issues, except for the special priority of Healthy Economy, as the average scores of Healthy Economy in 2003 and 2004 were lower.

To further understand the trends, the "best performance" and "worst performance" areas along the 5-year period are listed in Table 5. It is found that Health and Hygiene has continuously been rated as the best performing area. On the other hand, Healthy Economy was rated as the worst performing area from 2003 to 2004, and then Population Policy in the follwing 3 years while the performence of Healthy Economy was continuously improving during this time.

Mean value in each year / Priority areas	2003	2004	2005	2006	2007
Health and Hygiene	6.2	6.4	6.2	6.3	6.3
Civil Liberties and Human Rights	6.0	6.2	6.2	6.3	5.9
Healthy Economy	4.7	5.2	5.7	5.7	5.9
Integration with the Mainland	5.6	5.7	5.8	5.9	5.8
Urban Planning	6.0	6.0	5.9	5.8	5.8
Education System	5.5	5.6	5.6	5.6	5.8
Caring and Ethical Employers	5.4	5.5	5.6	5.6	5.7
Community Spirit	5.6	5.6	5.7	5.6	5.6
Environmental Protection	5.8	5.6	5.5	5.5	5.5
Population Policy	5.2	5.3	5.5	5.4	5.4

Table 4. Average performance score of each priority area in Hong Kong from 2003 to 2007

	2003	2004	2005	2006	2007
Best performance	Health and Hygiene 6.21)	Health and Hygiene (6.37)	Health and Hygiene (6.24)	Health and Hygiene (6.28)	Health and Hygiene (6.30)
Worst performance	Healthy Economy (4.73)	Healthy Economy (5.23)	Population Policy (5.47)	Population Policy (5.39)	Population Policy (5.35)

Table 5. Performance trend from 2003 to 2007

Similar to checking the changes in important ratings, the performance ratings of each priority area along the 5-year study period were used as response variable in a one-way ANOVA model with the year from 2003 to 2007 being the single factor. An *F*-test on overall significance revealed statistically significant difference (at 5% level) exists in three areas: Healthy Economy, Caring and Ethical Employer and Environmental Protection.

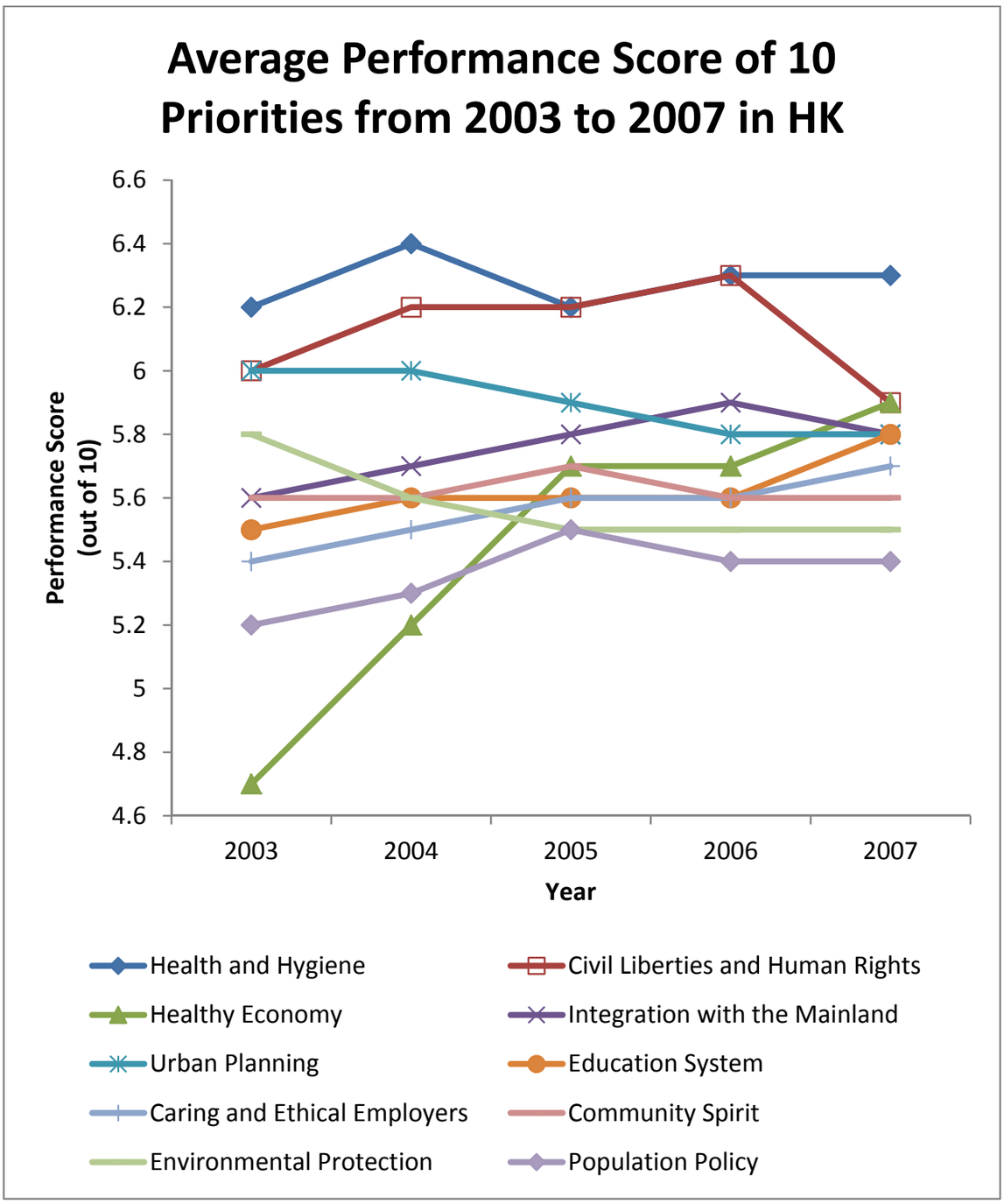


Fig. 4. Average performance score of each priority area in Hong Kong from 2003 to 2007

The mean scores and the corresponding groupings according to the post-hoc Tukey procedure for these three areas are given in Table 6. The post-hoc procedure performs pairwise multiple comparisons at 5% level of significance. It aims to determine which yearly mean score differs from the others. Homogeneous groups of yearly mean scores that are not significantly different from the others, and the corresponding yearly patterns, are identified.

Table 6a, b suggest an increasing trend in performance ratings in the priority areas of Healthy Economy and Caring and Ethical Employer. Regression analysis has been used to formally test the existence of such linear trend. As a result, significant trend coefficients (at 5% level) are found in both priority areas of Healthy Economy (linear trend: 0.272) and Caring and Ethical Employers (linear trend: 0.059).

Year	Group 1	Group 2	Group 3
Priority area: Healthy Economy			
2003	4.74		
2004		5.26	
2005			5.74
2006			5.74
2007			5.83
Priority area: Caring and Ethical Employer			
2003	5.41		
2004		5.56	
2005		5.60	
2006		5.67	
2007		5.69	
Priority area: Environmental Protection			
2003	5.73		
2004		5.44	
2005		5.53	
2006		5.53	
2007		5.55	

Table 6. Homogenous groups of yearly mean scores according to the post-hoc Tukey procedure

5.4 Importance versus Performance

For the 10 priority areas, their corresponding average importance and performance scores along the 5-year period are depicted in Fig. 5. The figure provides a set of descriptive information to schematically present the relative ratings of importance versus performance on the 10 priority areas for sustainable development.

Furthermore, we define

$$\text{Gap} = \text{Importance} - \text{Performance} \tag{4}$$

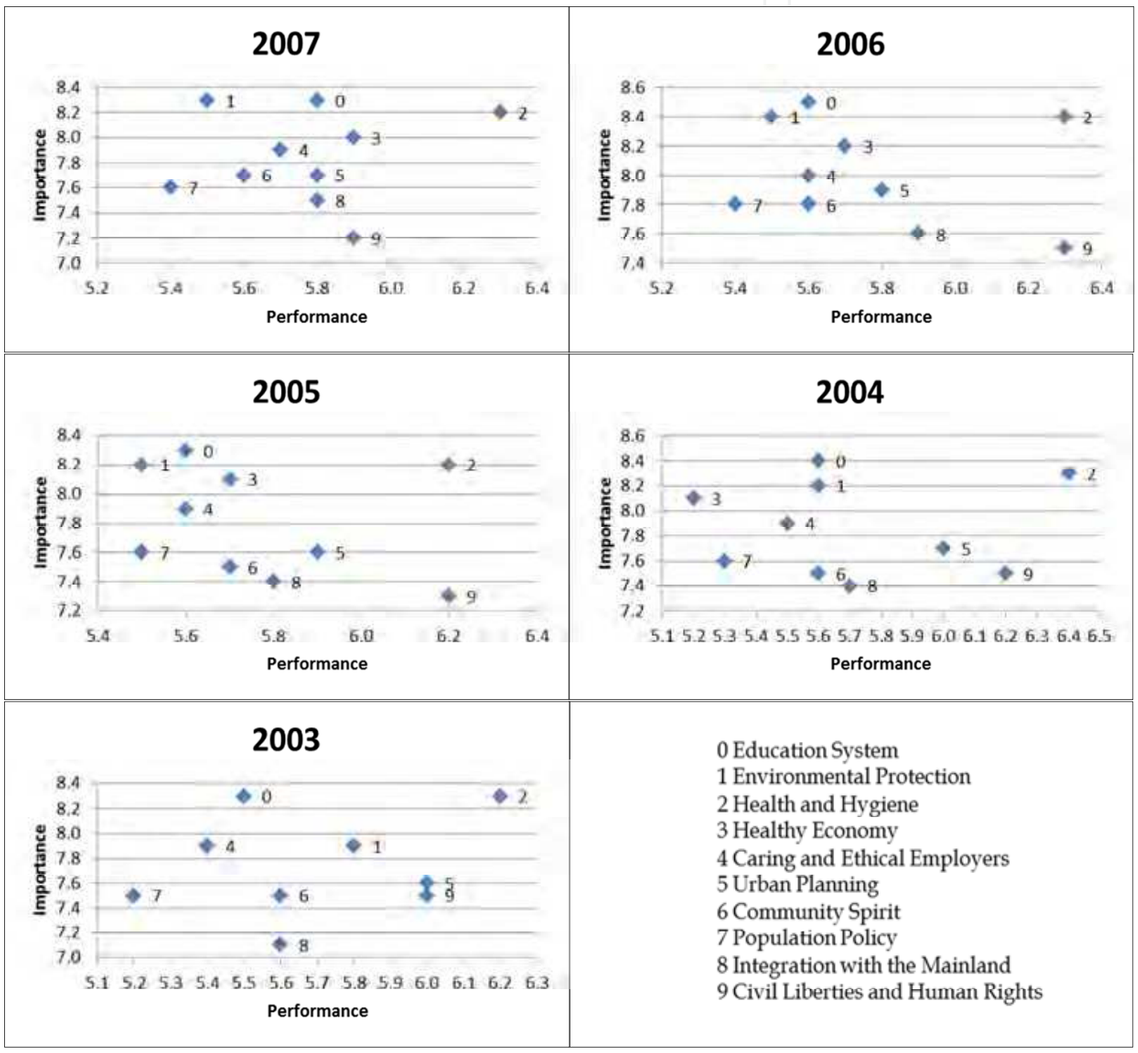


Fig. 5. Importance versus Performance from 2003 to 2007

The approximate performance gap in each of the 10 priority areas can be computed through this definition. Table 7 shows the "largest and smallest gap" results along the 5-year period. Healthy Economy was found to have the largest gap from 2003 to 2004. The largest gap

appeared in Education System for the year 2005. Then, from year 2006 to 2007, Environmental Protection shows the largest performance gap. On the other hand, Integration with the Mainland was recognized as having the smallest gap for the year 2003. Then, from year 2004 to 2007, the smallest gap was mainly found in Civil Liberties and Human Rights.

	2003	**2004**	**2005**	**2006**	**2007**
Largest gap	Healthy Economy (3.53)	Healthy Economy (2.92)	Education System (2.73)	Environmental Protection (2.99)	Environmental Protection (2.75)
Smallest gap	Integration with the Mainland (1.48)	Civil Liberties and Human Rights (1.35)	Civil Liberties and Human Rights (1.10)	Civil Liberties and Human Rights (1.21)	Civil Liberties and Human Rights (1.30)

Table 7. Gap trend from 2003 to 2007

6. Analysis

This section pays attention on the reasons that led to those trends of the 10 priority areas, especially for the ones which have a high average improtance score and those have special ranking or trend characters. On the one hand, the analysis explains how these data and trends were caused; on the other hand, governors can make adaptable policies for future development based on this analysis. First of all, the results revealed that Hong Kong people consider Education System, Health and Hygiene, and Environmental Protection as the three most important issues catching their concerns. The analysis of these three areas unfolds as follows.

Education System is the priority area always listed in the first place for the importance aspect from 2003 to 2007. In fact, education is a critical issue in changing people's norms, values, interests as well as behaviors. Educational strategy is significant in shaping the culture of the society, which deeply changes the norms of the people and influences individuals' behavior. Nowadays, education is also a hot topic, as more and more people pay attention on education, not only for young generation's education, but also for the adults' continuing education. Wong investigated the contribution of continuing education and leadership empowerment to sustainable development (Wong, 2003). For its performance part, we can see that Education System is listed in the middle of Table 4, meaning that Hong Kong people were satisfied with the performance of Education System in the past years. But the year 2005 is a particular case, since the gap of importance and performance in this year is one of the largest. This may reflect the society's overall disappointment with the education reform policies that gave rise to confusions and created uncertainties as well as lots of changes at that time. According to respondents' answers in the open-ended questions of the survey, for Education System, people of Hong Kong

demand the society to improve the quality of teaching and the government to restructure Hong Kong's Education System.

Health and Hygiene is another priority area with high importance scores. It gets the same score with Education System in 2003, and is listed in the second place during 2004 to 2006. In 2007, it's in the third place. At the same time, Health and Hygiene also acts as the priority area which always gets the highest performance score from 2003 to 2007. This means that Hong Kong people remained satisfied with the performance of Health and Hygiene along the 5-year study period and reasons should relate to the community's general awareness in Health and Hygiene and the government's effort in alleviating public health standards, particularly after the severe acute respiratory syndrome (SARS) ourbreak in 2003. Asian countries and Canada suffered the SARS in 2003, the outbreak of this pestilence has aroused public concern over Health and Hygiene. After the SARS crisis, more people become aware of the importance of the environment to their health. Subsequently, a practical assessment scheme for assessing the Health and Hygiene performance of apartment buildings in Hong Kong has been developed by some scholars (Ho et al. ,2004). Hong Kong government has spent a lot of efforts and resources in this area and more policies have been put forward to prevent the occurrence of disease in various ways. The survey results suggest that these actions are effective.

Environmental Protection is also an important issue, as it always lists in the first three of those 10 areas during the 5-year study period. But its performance rating always ranks at the low side as shown in Table 4. This indicates that people were not satisfied with the environment in Hong Kong, although it got a high importance score. Following Hong Kong's return to China in 1997, Hong Kong has been struggling to retain its status as a world-class city and the financial capital of East Asia. In the fight to maintain a competitive edge, air quality has taken on increased importance. But the results of ANOVA in Table 6c show that there is a significant difference concerning the performance between 2003 and the years after. In fact, Hong Kong's long-persisted air pollution problem has been internationally recognized. As early as 1966, the government set up a committee to study air pollution generated by the industrial activities and motor vehicles. Despite historical concerns, air quality deteriorated markedly in the 1990s. As reported by the Hong Kong Environment Protection Department in 2002, the increase in the number of poor-visibility days raised public awareness of the problem. At the same time, from 2006 to 2007, it shows the largest performance gap, this is because that the air pollution problem is getting more obvious and people are demanding to see a clear sky again. In particular, Hills discussed the evolution of environmental policy in Hong Kong and a regional environmental management agenda (Hills, 2002). According to the survey results, along the 5-year study period, air quality is consistently identified as the major aspect which needs to be further improved, although currently people are satisfied with the performance in this area. More efforts made in this aspect will definitely help people achieve quality of life.

Besides the above three important priority areas, Healthy Economy and Population Policy are two other areas with interesting results worth to be mentioned. Due to the fact that Hong Kong's economy has reached its bottom in 2003 and 2004 since the Asian financial crisis occurred in 1997, and started to pick up slowly from the second half of 2004, the area of Healthy Economy was rated the worst performed area in year 2003 and 2004, but rapidly improved in its performance since 2005. When the economy started to rebound, many Hong

Kong people switched their attention to the immigration problem from mainland China, especially because the local news often reported the inflow of pregnant women from the mainland to give birth in Hong Kong, whereas the birth rate of local residents keeps on decreasing. This may increase the number of people to opine that the government should perform better in setting up her population policy. This is why that Population Policy acted as the worst performance area from year 2005 to 2007. At the same time, we find that the area of Healthy Economy has been continuously improved, according to the ANOVA results on the possible change in performance ratings. The successful experience of achieving improvement in this priority area can be summarized and used as a reference in other areas. Let's see an example, from Table 6a, we can see an increasing trend in performance rating in Healthy Economy, this may reflect the rebound of Hong Kong's economy in post-SARS outbreak since 2003, employees also started to have their incomes being increased again. At the same time, Healthy Economy suffered the largest gap from 2003 to 2004. This is because that after experiencing the Asian financial crisis in 1997, its impact continuously affected Hong Kong's economy. The SARS incidence in 2003 further expedited the economy from bottoming out. At that time, a strong voice longing for a Healthy Economy should be anticipated.

The area of Population Policy has a relatively lower importance rating and the lowest performance rating. In particular, it received the worst performance score from 2005 to 2007 with managing immigration from the mainland China being the major aspect demanded for further improvement. Law and Lee investigated the relationship between citizenship, economy and social exclusion of mainland Chinese immigrants in Hong Kong (Law & Lee, 2006). Three interrelated dimensions of the social exclusion of Chinese migrants in Hong Kong: globalization, political attempts of territorial states, and nature and strength of local place-based social identity, were discussed. Hong Kong is often viewed as a society of Chinese immigrants. Hong Kong's immigration control regime has changed in accordance with the development of the economy. Different regime was applied in different historical periods, such as Touch-Base Policy in 1980, One-Way Permit, Two-Way Permit, General Labor Importation Scheme, Admission of Talents Scheme, etc. On the one hand, these policies were helpful to the economic development in Hong Kong by providing labor resources during a certain period of time. But on the other hand, it also created a lot of other problems at the same time. The newcomers were sometimes seen as aggravating the territory's social problems by increasing competition for jobs, houses, and welfare benefits. After the Asian financial crisis in 1997, Hong Kong's economic recession deepened. Hong Kong people's negative perception towards new arrivals further intensified. Looking ahead, to reinforce Hong Kong's high-tech and high value-added industrial development strategy, an appropriate population policy is needed. Given the keen competition among global cities, the government needs to continuously seek mainland Chinese talents that might help transform the economy into a knowledge-based metropolis in order to enhance the competitive status of Hong Kong. As such, it is essential to have a flexible immigration policy to attract mainland Chinese talents to root in Hong Kong.

7. Conclusion

There is no doubt that nowadays many societies are concerning their abilities to satisfy the needs of present generation without jeopardizing the possibility of doing so for future

generation, thus the issue of sustainable development becomes an important issue for many countries and regions. It is therefore necessary to produce meaningful measures capable to effectively monitor the current progress on sustainable development for the region concerned. This chapter introduces a methodology to construct a regional sustainable development index which can identify important priority areas being considered by people through a multi-stakeholders engagement process, and measure people's satisfaction levels toward each area. The city of Hong Kong is used as an example to present details of the methodology, including identification of prioritizing areas, the SDI model, and the data measurement process. There exists, however, two major limitaions in the project of measuring the HKSDI. The first point being the response rate of telephone survey involved in the study is not very high. Ideally a good telephone survey requires a high response rate, but the resources we can afford on the interviewing cost and the length of the questionnaire were limited, so the response rate in our study is not ideal. The second one is that the score given for one priority area may mean for various aspects. Although each respondent has provided a rating on his/her importance and satisfaction levels towards each priority area, they may in fact refer to different specific aspects in that area. Nevertheless, this problem is unavoidable in practice because individuals have their own concerns in each priority area. Although there are some limitations, we have achieved our measuring and monitoring goals. Hence, this methodology can be adoped by different regional areas to measure and monitor their sustainable development progress.

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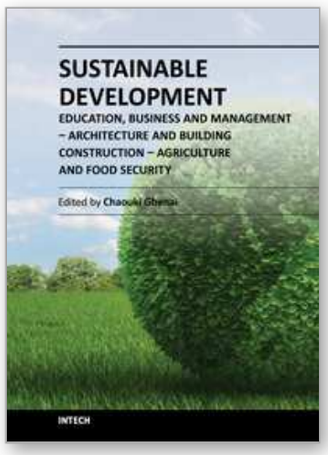
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Securing the future of the human race will require an improved understanding of the environment as well as of technological solutions, mindsets and behaviors in line with modes of development that the ecosphere of our planet can support. Some experts see the only solution in a global deflation of the currently unsustainable exploitation of resources. However, sustainable development offers an approach that would be practical to fuse with the managerial strategies and assessment tools for policy and decision makers at the regional planning level. Environmentalists, architects, engineers, policy makers and economists will have to work together in order to ensure that planning and development can meet our society's present needs without compromising the security of future generations. Better planning methods for urban and rural expansion could prevent environmental destruction and imminent crises. Energy, transport, water, environment and food production systems should aim for self-sufficiency and not the rapid depletion of natural resources. Planning for sustainable development must overcome many complex technical and social issues.

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