

Performance of Sustainable Urban Development in China; Perceptions in the past and challenges for the future

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Introduction

During the last decades the urban environment of China developed rapidly towards the fastest growing economic area in the world. The cities are also extending towards huge dimensions and therefore need to have a sustainable urban development in order to be prepared for the near and far future of the city and her citizens. Sustainability indicators are tools for monitoring progress towards sustainable development and used for the formulation of efficient policies (World Economic Forum, 2001; UNCSD, 2001; Bossel, 2001). Integrated information on sustainability can be obtained by means of a sustainability index. An integrated index can transform a large number of data and other indicators into useful information for decision makers and urban environmental managers. It is crucial that data sources on sustainable development are accessible and regularly published. The resulting performance or ranking of the sustainability indicators can be used for (re)formulating of efficient policies for a sustainable urban development and improved management of cities. Voluntary approaches or agreements can be used as a powerful instrument to reduce urban environmental pollutions and increase the living conditions and environment of the citizens. This paper will discuss the use of an urban sustainability indicator for monitoring the sustainable urban development of four selected cities in China during the period from 1994 to 2000. The possibilities for implementation of voluntary approaches in China for optimising the efficiency of the improvement of the urban environment will be also briefly discussed.

Monitoring Sustainable Development in China

The importance of a sustainable development of cities was issued in 1985 on the First National Conference on Urban Environmental Protection in Luoyang City. The parties agreed on a Comprehensive Control on Protection of the Urban Environment in major cities in China. Since then, many research is carried out and several monitoring tools are developed to measure the sustainable development of cities in China. For analysing the performance of sustainable development in China a Urban Sustainability Index (USI) was developed by Zhang (2002) which consisted of 22 representative indicators that were selected from a sustainability indicator database. For testing urban sustainability indicators with the USI, four case cities were selected from distinguishable areas in China that differ in economic and social development (Zhang, 2002). These cities are Qinhuangdao City in Hebei Province, Maanshan City in Anhui Province, Taizhou City in Zhejiang Province, and Wuhai City in Inner Mongolia Autonomous Region. In the Chinese context, Taizhou City is a developed area, Wuhai City is an under-developed

area, and Maanshan City and Qinhuangdao City are in between. Both Qinhuangdao City and Taizhou City are seaside cities, and Ma and Wuhai City are inland cities. Port, tourism and transportation are the main functions for Qinhuangdao City, steel industry for Maanshan City, chemical and medical industries for Taizhou City, and coal mining and livestock farming for Wuhai City. In terms of geographic distribution, Qinhuangdao City is located in the Northeast and the beginning of the Great Wall is within the city, Maanshan City is located in the East and the Yanzhi River is crossing the city, Taizhou City is located in the Southeast, and Wuhai City is located in the Northwest and the Yellow River is crossing the city. The USI has been tested as an effective tool for measuring urban sustainability in China. The detailed information on the development of the USI refers to Zhang and Van Dijk (2002). Table 1 explains the USI and its building blocks, and exists of the component indices and the related individual indicators.

Table 1 The Building Blocks of the Urban Sustainability Index

Components Index	Sub-components Index	Indicator
Urban status (development) index (0.41)	Socioeconomic development index (0.50)	Per capita GDP (0.36) Growth rate of GDP (0.20) % of population below the poverty line (0.30) Educational investment share in GDP (0.14)
	Environmental index (0.30)	Daily concentration of SO ₂ (0.20) Daily concentration of PM ₁₀ (0.24) % of water meeting the drinking quality standard (0.22) Average concentration of COD (0.14) Area of arable land per capita (0.10) Per capita water resource (0.10)
	Institutional capacity index (0.20)	Citizens' satisfaction with their city
Urban coordination index (0.34)	Coordination index of economic and environmental (0.34)	Generation of waste water per 10,000 CNY GDP (0.15) Ratio of sewage treatment (0.20) Generation of SO ₂ per 10,000 CNY GDP (0.15) Recycling ratio of urban wastes (0.20) Environmental investment share in GDP (0.30)
Urban potential index (0.25)	Ecological and environmental potential index (0.60)	Ratio of renewable resources consumption to their generation (0.20) Ratio of non-renewable resources consumption to their substitution (0.25) Ratio of degradable pollutant emission to their purification (0.25) Ratio of non-degradable pollutant emission to their purification (0.30)
	Welfare growth potential Index (0.40)	Growth rate of basic needs index (0.60) Growth rate of income per capita (0.40)

Note: Value in the parentheses is the weight of the index or indicator.

Source: Zhang and Van Dijk (2002)

In table 1 urban development is defined by the indices for socio-economic development, environmental conditions, and institutional capacity (UNSCD, 1996). First, the urban coordination refers to the efficiency of urban performance and the effectiveness of urban management. There are five urban sub-systems, the social, economic, environmental,

institutional, and surrounding area systems. Urban sustainability requires that a city takes all these five sub-systems into account, and adopts the integrated policies for minimizing its negative impact on urban environment, and maintains the resources consumption and emissions within the resources regeneration ability and environmental load-capacity. Second, urban coordination indices are measured with help of the indicators as shown in Table 1. Third, urban potential refers to the time dimension of urban sustainability. The question is how long urban development can be sustained without progressive diminution of urban sustainability. Urban potential is measured through the indicators as shown in Table 1 that are related to natural resources consumption and regeneration, pollutants emissions and environmental purification capacity, as well as social welfare growth potential.

Sustainable Urban Development

The urban sustainability in the four demonstration cities has been monitored over a timeframe of 6 years in the period from 1994 to 2000. They all show a positive development of the USI within this time frame (figure 1). From 1994 to 2000, the USI has increased by 43% in Maanshan City, 37% in Qinhuangdao City, 28% in Taizhou City, and 33% in Wuhai City. Among the four cities, Maanshan has been along the way from weak sustainability to sensible sustainability during the period from 1994 to 2000. Both Qinhuangdao City and Taizhou City were in the area of weak sustainability from 1994 to 2000, but has moved towards sensible sustainability. However, Wuhai City is still moving from the area of non-sustainability towards weak sustainability. It is obvious that the USI was moving upwards slowly before 1998 in the cities of Taizhou City and Wuhai City.

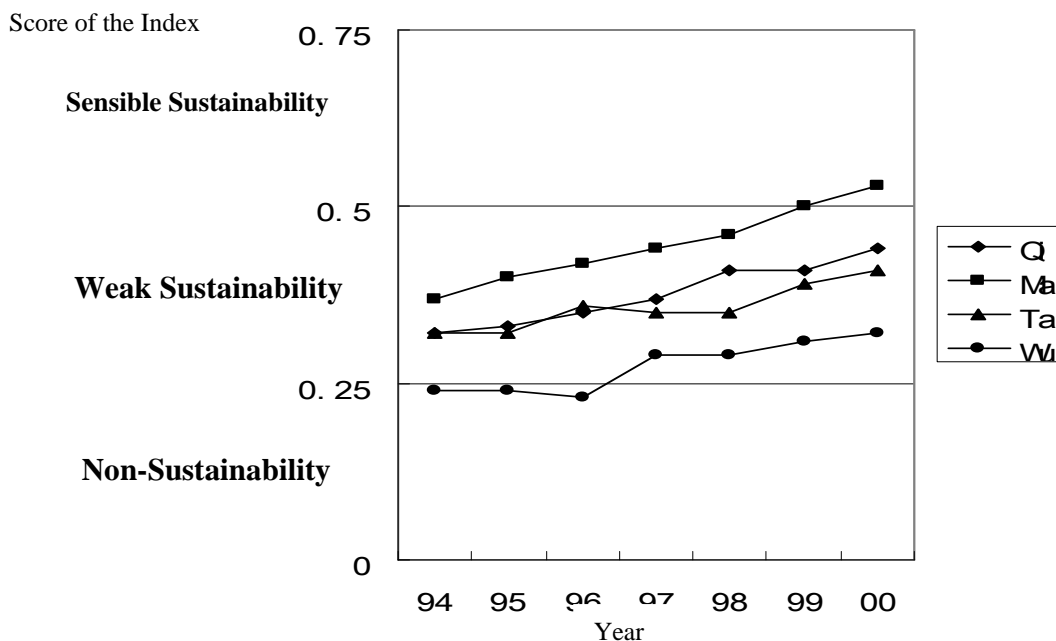


Figure 1 Urban Sustainability measured by USI in Qinhuangdao (Qi), Maanshan (Ma), Taizhou (Ta), and Wuhai (Wu) (Zhang, 2002)

The fastest growth in urban sustainability appears to be going on in Taizhou City. It is very likely that the Third National Environmental Protection Conference which was held at the end of 1997 has influenced the local authorities to pay more attention to urban environmental comprehensive control. As a result, progress has been made in the field of urban environmental protection, particularly in cities where the economy is comparatively stronger. For the city of Wuhai City, given its weak economy and serious poverty, urban sustainability has slowly increasing since 1998. The top priority for development in Qinhuangdao before 1998 was the tourism industry. And thus, the city has been implementing strict ecological conservation policies. Its forest covering ratio and protected areas percentage to the total areas are the highest among the four cities, and even in the whole country. However, the local authority of Qinhuangdao has changed policies by shifting to industrialization and urbanization after 1998. The direct reason has been the serious decline in the tourism industry since 1998. As a result, industrial emissions and natural resources consumption have increased rapidly, and thus its ecological and environmental potentials for supporting further development have significantly decreased since then.

Environmental decline in cities is partly caused by the poverty of the citizens. There are indications that poverty obstructs improvement of local sustainability and is one of the roots of environmental pollution and ecological destruction. Due to a lack of money there are no investments in environmental protection which contributes to a low ecological and environmental quality of a city. Therefore, poverty is seen as both the cause and effect of non-sustainability (WCED, 1987; World Bank, 1997).

Acceptation of Sustainable Urban Development in China

It is still a long way to go before sustainable urban development will be fully accepted in China. For the time being the integrated urban decision-making process is not sufficiently developed, and existing urban institutions are not sufficiently coordinated. Furthermore, there is a lack of sustainable policies and strategies for urban development. This insufficient coordination obstructs the development and implementation of sustainable policies. But not only the policies and strategies for urban development are not satisfying, also the urban institutions are not prepared for their task. They have to struggle with local administrators that are more concerned about short term profits and give priority to direct benefits for local politicians. Last but not least, there is a lack of environmental awareness and responsibility for environmental conservation by decision-makers and citizens. The evidence is that most of the indicators related to the environment in this urban environmental examination system applied to the four cities were not satisfying and need further improvement. From the socio-economic development index (figure 2) it can be seen that there is a huge gap in the economic scale of the four cities. In 2000 the GDP per capita was 4 times higher in Taizhou City compared to Wuhai City. Big differences on economic development and economic scale are visible between the Western and Eastern part of China, despite the general booming of the economy. The national growth rate in the western part of China is generally 20 years behind the eastern counterpart (Niu, 2001).

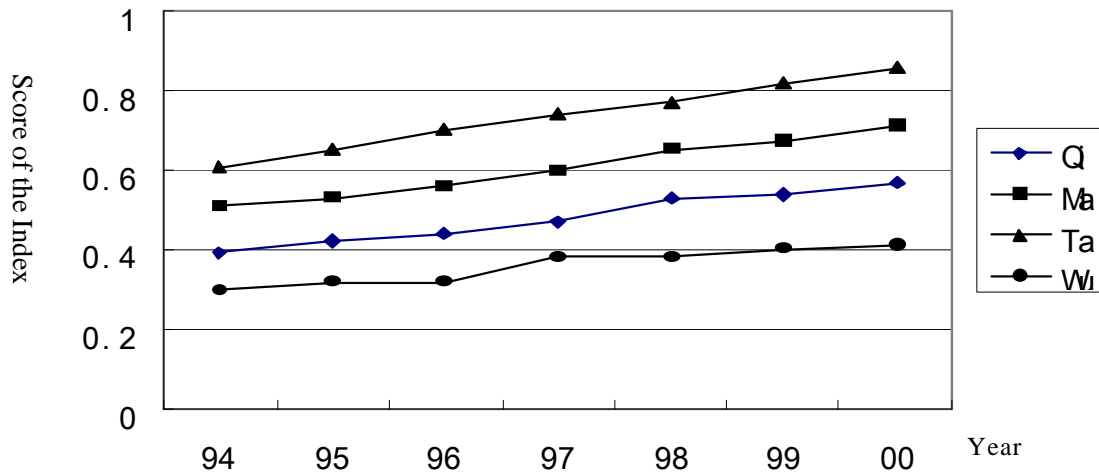


Figure 2 Socio-economic Development Index of Qinhuangdao (Qi), Maanshan (Ma), Taizhou (Ta), and Wuhai (Wu) (Zhang, 2002)

The effect of a high economic growth and a strong economy is the provision of jobs, housing, services, and employment. Usually, no adequate attention is paid to the built and natural environment which causes environmental decay. Serious environmental pollution, noise annoyance, road congestion, fresh water shortage and load shading due to electricity shortage can all mean a serious threat to welfare and well-being, thus obstructing the cities' sustainability. For example, Taizhou City is the strongest in socioeconomic sustainability, but its environmental sustainability is the poorest among the four cities.

The performance on institutional capacity is based on how citizens are satisfied with their city. Citizens were asked to fill in a questionnaire with twenty issues regarding housing prices, sewerage, public transports, schools and university, social welfare, clean drinking water, employment, transparent and useful media, open local government, democratic local government, accountable local government, efficient local government, participation in decision-making, income, garbage collection, air quality, security and safety (crimes), roads, electricity supply, and water supply. Table 2 presents the results of the questionnaire and shows only the issues scoring low and high for the urban institutional capacity of the four cities.

Table 2 Citizens' satisfaction with their city (based on questionnaire in 2000) (Zhang, 2002)

City	Low score issues (no satisfaction)	High score issues (satisfaction)
Qinhuangdao City	transparent and useful media; open local government; democratic local government; accountable government; social welfare; efficient government; income; security and safety; garbage collection; air quality	electricity supply; clean drinking water
Maanshan City	transparent and useful media; open local government; democratic local government; accountable government; air quality; garbage collection	clean drinking water; electricity supply; water supply
Taizhou City	transparent and useful media; open local government; democratic local government; accountable government; efficient government; clean drinking water; water supply; participation in decision-making; security and safety; garbage collection; air quality	electricity supply; housing price; income
Wuhai City	transparent and useful media; open local government; democratic local government; efficient government; accountable government; income; security and safety; air quality; garbage collection; public transport; road; participation in decision-making; clean drinking water	electricity supply

From Table 2, it can be concluded that the citizens in the four cities are not satisfied with the city's governance. The level of transparency and useful media; open local government; democratic local government; accountable government; and efficient government does not satisfy the citizens of the four cities. Also urban air quality and garbage collection should have higher priority for urban developers and decision-makers. On the other hand the electricity supply has met the citizens' energy requirements. In most of the cities in this research the people do not feel safe and the social security system is not convincing. All four cities show an increase in economy in the period from 1994 to 2000 and moreover also the available budget for environmental issues has increased. As a result of the economic welfare and the growth of the population, an over extraction of the groundwater resources took place which causes a decline of the urban ecological and environmental potential index (figure 3). The level and the quality of the water in the deeper layers are decreasing and in the coastal areas fresh water is threatened by penetration of saline seawater.

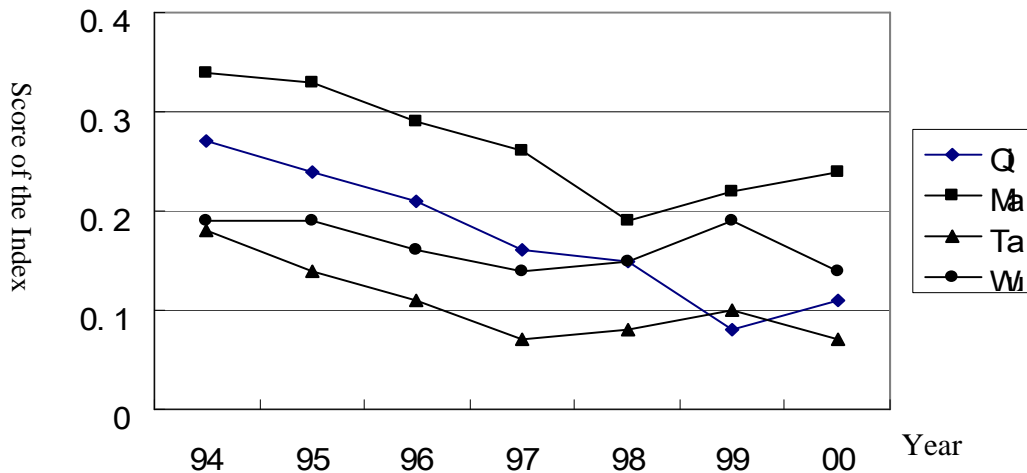


Figure 3 Ecological and Environmental Potential Index in Qinhuangdao (Qi), Maanshan (Ma), Taizhou (Ta), and Wuhai (Wu) (Zhang, 2002)

Other indicators contributing to a decrease of the index for urban ecological and environmental potential are deforestation and over fishing. All natural forest in the four cities was uprooted because of extension of the urban areas, but most of the cities do not put any effort in providing financial resources for reforestation. In Qinhuangdao, the over fishing has successfully been reduced by restriction measures on the size of the fishery fleet. The urban environmental quality in a city is an important environmental and ecological factor that can be lowered by degradation of the urban environment. The increase of city emissions and the exceeding of allowable levels of air pollution both lead to a low valuation of the indicator.

There is a strong relation between welfare and economic growth in all four cities between 1994 and 2000. Local authorities had assigned their top priority to economic growth during that period, and paid less or no attention to environmental improvement. This resulted in an urban environmental degradation in these cities and did have a negative impact on the scores of the Environmental Potential Index. For the citizens an increase in welfare was observed with a significant correlation between the GDP per capita and socio-economic development. This ongoing trend on economic growth in China can last for another period of time, but it is not unlimited and can turn into a social and economic disaster after a sudden decline in the economy of a city or an area caused by natural (SARS) or artificial influences (shifting markets, trade boycott).

Urban Sustainability

In the economic definition of urban sustainability the economic performance plays a central role in urban development. China made tremendous progress in the urban areas within the economic dimension, but what are the costs they have to pay for environmental losses? From the environmental point of view urban sustainability of a city can be described as nature conservation, which can be monitored by environmental indicators. From this environmental aspect, the four cities tend to be unsustainable

because of priorities given to economic and social urban development. The central role of economic performance in sustainable urban development is correlated to the urban economic scale of cities. The economic condition is a key factor for improving urban sustainability, and needs considered physical planning and urban management. Maintaining the cultural heritage, limiting pollution and providing decent housing are also important as well as all kinds of social policies concerning health care, education and equality (Van Dijk, 2001).

Public Participation

One of the complaints of the citizens is that there is limited or no public participation in the urban management. For a successful participation, a number of elements must be taken into account (UNCHS, 1999). The first element is the availability of information, which is the foundation of public participation. Relevant information such as decisions, local priorities, strategies, and an action plan must be available to the stakeholders. The second element is building consensus among the stakeholders. The consensus can be built by negotiations, discussions, and sharing ideas among the stakeholders. Therefore the strategies and action plan can be drawn up jointly and agreed upon by all stakeholders. The last element is to supervise the implementation of the strategies and action plans. Public supervision can guarantee that the process of implementation follows the built consensus, and achieves the expected goals. There is very limited access to information as well as public supervision, particularly in Wuhai and Taizhou (table 3).

Table 3 Public Participation in Qinhuangdao, Maanshan, Taizhou and Wuhai (Zhang, 2002)

Indicators	Qinhuangdao	Maanshan	Taizhou	Wuhai
Access to information on local decision-making	33.1*	37.4	24.5	24.9
Degree of consensus on main decision-making	66.3	70.5	63.8	58.6
Public supervision on main activities	38.9	34.9	29.4	26.1

*100: Best; 0: Worst

The limited access to information and public supervision caused local corruption and weak institutional capacity in these cities. Another important factor influencing urban sustainability is the distribution of economic welfare in urban management. Social progress is determined not only by economic growth, but also by the fair distribution of welfare.

Voluntary Approaches in China's Urban Environmental Management

Voluntary approaches or environmental agreements (EEA, 1997) can contribute to a limitation of conventional environmental regulations and can thus be able to solve complex environmental problems (Alberini and Segerson, 2002). In Europe voluntary agreements do have a positive effect on the reduction of industrial emissions, on the improvement of industrial energy efficiency and provides the government with tools to improve their policy on urban environmental issues (Rietbergen et al., 2002; Krarup and

Ramesohl, 2002; Dalkman et al., 2005). In China this phenomenon on voluntary agreements is a relatively new environmental management tool that can be used when dealing with complex environmental problems. Environmental system analysis (ESA) can be used to analyse such complex environmental issues in a systematic way and help to design sound covenants and agreements. ESA integrates across disciplines of environmental and social sciences and analyses different compartments (soil, water and atmosphere) at different scales in time and space. From the moment that a voluntary agreement is drawn up and has been validated, it is ready to be signed and implemented. In the short and long run the effect of implementing voluntary approaches will create a better natural environment with a sustainable use of resources. Recycling wastewater and solid wastes can lead to well-considered use of energy and resources (EPA, 2003). The benefit of the implementation of voluntary agreements is also the fact that both an improvement of the environment as an improvement of institutional operation can be observed.

But what will be the next steps for promoting voluntary approaches in China? There are several challenges to deal with and one of them is the continuous increase of prosperity that increases the demand for energy and food. The population of China is still increasing and also the migration of people from the rural areas force cities to extend and further urbanize rural areas. If nothing is done and if we continue our business as usual the alarming decrease of our natural environment will continue and priority will be given to the social and economic issues. However, the assignment of six voluntary approaches on the International EU-China Conference on Innovative Environmental Management and Sustainable Development in Qinhuangdao in June 2005 showed that there is a huge willingness of Chinese industries and companies to cooperate with governmental organizations like the State Environmental Protection Agency (SEPA) or the local Environmental Protection Bureaus (EPBs), in order to find proper solutions for the still increasing environmental pollution in the country. These assignments will soon contribute to the cities' environmental performances and increase the environmental awareness of industries, city managers, and the citizens. Active publishing of the progress and results as well as public access to these pieces of information will also force investments and subsidies from the industries and the government and thus will help to prevent that a point of no return on environmental destruction will be reached. Therefore, we cannot afford to wait till tomorrow with the implementation of voluntary approaches, but we need to realize that also today we have to show environmental awareness and take responsibility. The Netherlands, Germany, and other European countries have already proved that voluntary agreements are successful but some pre-conditions need to be considered in order to let this happen also in China. The first one is that quantitative targets need to be defined very clearly and that the time-schedule is well defined. The contractors are monitored regularly by a reliable and independent environmental agency. The industries and companies can learn from each other during regular evaluation meetings where the progress and results are discussed and efficient burden sharing takes place. Therefore, a good communication between the parties is necessary, and individual sanctions must be executed if industries and companies do not comply with the environmental targets set. Unfortunately, such an approach with voluntary agreements also attracts so-called "free riders" that try to benefit from these agreements without taking part themselves. Also to bring the sanctions into effect sometimes turned out into a

long jurisdictional conflict. Nevertheless, the overall effect of the implementation of voluntary agreements will not only be a benefit for the environment, but also for the socio-economic performance of Chinese cities.

Conclusions

The declining natural resources and the environmental degradation contribute negatively to overall urban sustainability. It is therefore suggested that the top priority of improving urban sustainability in China should be assigned to urban environmental protection and management.

Economic development can affect, but does not determine, environmental conditions. Necessary economic development is one of the key factors for improving urban sustainability. Nevertheless, urban sustainable development not only be achieved by economic growth. In fact, urban sustainability is dependent on how we deal with the tradeoff between economic sustainability and environmental sustainability, and how we manage the cities.

It is agreed upon that urban environmental degradation is in line with economic growth in each of the four cities. The fast urban economic growth has resulted in declining urban environmental sustainability in China. This is believed to be the crucial lessons learned from the developed world in their initial stage of economic growth after World War Two. Pursuing fast economic growth without paying adequate attention to the environment is one of the most important reasons.

Weak urban sustainability is directly related to the urban environmental degradation. But the fundamental reason is believed to be inefficient urban management. For implementing urban management effectively in China, it is vital to redefine the role of local government, reform local organizational structure, enhance local participatory institutional capacity, properly distribute the urban welfare, and thus integrate economic, social and environmental objectives into the local strategic and action plans.

Voluntary agreements have been a useful policy tool for decreasing the industrial energy intensity in Europe. Meeting environmental goals in an effective and efficient way is possible if all stakeholders agree on the conditions and if the targets and the time schedule are clearly defined. Also unpopular measures and sanctions have to be executed in cases that industries and companies do not comply with the environmental targets set. It is feasible for China to adopting voluntary approaches since most of the companies show their interest in improving the environmental quality.

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