Combining the Government Behavior with the Market Mechanism for the Virtuous Cycle of Innovation and Sustainability

－－Based on the Practice of China's Sustainable Communities

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Abstract: Innovation is the means and sustainability is objective (or idea). Innovation services on sustainability and sustainability guides innovation. Both are cause-and-effect, form the positive feedback mechanism, and form a virtuous cycle, thus make both mutual promotion and common development and evolution. The key is the positive feedback mechanism formed between innovation and sustainability. Based on the practical experience of China's sustainable communities over more than 20 years, this paper argues that only the government behavior and the market mechanism effectively combine, can form the positive feedback mechanism between innovation and sustainability, thus achieving a virtuous circle. This paper is divided into three parts as follows.

Key words: Innovation; sustainability; Government Behavior; Market Mechanism

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1 Promoting the Formation of a Virtuous Cycle of Innovation and Sustainability under the Guidance from Government Behavior and Based on the Market Mechanism

Since 1912 J. A. Schumpeter introduced the concept of innovation into economics and used it to explain economic growth, people have done a lot of research on innovative content, operation mode, dynamic mechanism, factors, and so on. Although people still have different points of view on innovation, but developed some basic consensus. For example, people take the innovation as generating new knowledge, new technology and new techniques, using the new way of production and the new mode of economic management, improving product quality, developing and producing new products, providing new services, pioneering and occupying the market and realizing the market value. The models of innovation are divided into technology-driven model, market pulling model, technology and market interaction model, and integration model (including the generation of new ideas, research and development, design, the parallel process of manufacture and marketing), etc. The innovation factors are divided into external factors (including technology background, market conditions, government regulation, partnerships), internal factors (including enterprise innovation consciousness and technological conditions, allocation of resources, process management), communication (including between internal and
external, between departments within the enterprise, the reliability of information sources, information channels of patent, the timeliness of feedback, etc.). In particular people realize that innovation is built on the basis of market economy, and the enterprise is the main body of innovation, the market mechanism is the basic driving force of innovation, but needs government support and promotion.

However, most previous research on innovation focused on the economic field and to promote economic growth. It is increasingly recognized in recent years that innovation can not only promote economic growth, but also promote social development, environmental management and ecological improvement, that is, innovation can promote sustainable development or sustainability. However, if this possibility into reality, the government behavior should be as guide and the market mechanism should be as foundation, and to explore the ways and means for the combination of government behavior and the market mechanism in order to promote a virtuous circle of innovation and sustainability.

Regarding the combination of government behavior and market mechanism to promote economic growth, although people have different points of view, in particular, there is a large degree of opposition from liberalism and nationalism, but generally speaking, only the government behavior and market mechanism properly combined, can promote economic growth, which has been widely accepted and formed the common understanding. And the more enter "public product" field, the greater the role of government. However, previous research and practice mainly in the economic field, and later developed into the social sphere, such as education, health, public safety, social security, etc., but involving the ecological environment, especially the sustainability of global atmospheric change is the new problem in recent years. Based on practical experience and theory, people believe in order to resolve the issue of sustainability, the government behavior combined with the market mechanism is also needed, and government behavior should play a greater role.

That is to say, whether it is to promote innovation or sustainability, we need government behavior combined with the market mechanism, and innovation can promote sustainability, and sustainability requirements (or purpose) can guide and promote innovation, thus to achieve a virtuous cycle of innovation and sustainability. The key here is to explore the ways and means of the combination of government behavior and market mechanisms. This requires both a theoretical exploration of innovation and more practical innovation and experience.

On innovation, in theory, should be based on market mechanisms, but needs government support and guidance, which has made great progress to form the theories of national innovation systems, regional innovation systems, innovative economics and evolutionary economics. And public economics, development economics, institutional economics, and so can provide theoretical support to innovation. In practice, for different countries and regions, the different stages of economic development, different industries, different types of innovation, and so on, government behavior and the market mechanism play their role in different degree, and the both combine each other in different ways and means. Based on both the theory and practical experience, people draw the basic conclusion of promoting
innovation that people should take market mechanism as the foundation and the
government behavior for guidance, but for developing countries and regions, weak
industry, public products and service, and innovation of the infrastructure, the
government should play a bigger role.

On sustainability, especially how to realize sustainability, in theory, people
realize that the sustainable problems appear in the background of economic
globalization, trade liberalization and market economy, but also can be resolved on
this basis. This means that the market mechanism for achieving sustainability will
continue to play a fundamental role. However, the sustainability is not only the
responsibility of countries in the world, but also the obligation to future generations of
mankind. The stronger "public goods" needs more government support and guidance,
including joint action by Governments. In practice, people tried to combine the
government behavior with the market mechanism effectively, adopt various actions,
such as a fuel surcharge, formulating vehicle emissions standards, giving preferential
tax for new energy production, supporting the development and innovation of various
new energy and renewable resources, and supporting the green technology transfer,
etc.

In short, the government behavior combined with market mechanism, can
promote innovation and sustainability. Innovation can promote sustainability and
sustainability can guide innovation. The key is to explore the mechanisms of the
government behavior combined with market mechanism effectively, so as to make the
innovation and sustainability form the positive feedback mechanism and a virtuous
circle. In this regard, including China, countries in the world have done a lot of
exploration, and achieved some progress.

2 The Practical Experience of China National and Provincial Sustainable
Communities since 1986

China's sustainable development communities began in 1986. At that time many
regions in China, especially in the southeast coastal area, economy developed rapidly
and at the same time, population quality was not high, social undertakings lagged
behind, environmental pollution became serious problem, which affected the further
development of the economy and society. In this case, the Ministry of Science and
Technology, together with other government departments, chose Changzhou City and
Huazhuang Town, Jiangsu Province, as comprehensive social development
communities.

In 1997, approved by the state council, the "comprehensive social development
communities" was renamed "sustainable development communities", its purpose is to
rely on scientific and technological progress, and mechanism innovation and system
construction, improve the capability of sustainable development, explore the
mechanism and model of coordinated development of economy, society, environment
and resources for different type region implementing sustainable development
strategy.

Under the guidance of the central and local governments, and the joint
participation of enterprises, scientific research institutes, universities, various social
groups and even some international institutions, 58 national sustainable development communities and 77 provincial sustainable development communities have been set up.

The types of these communities include city transformation, small town construction, community management, resource-based urban development, and so on. Their capacity-building for sustainable development is divided into six aspects: institutional innovation, technological progress, economic development, resources and environment, social development and public participation, which are interlinked and mutually reinforcing.

![National Sustainable Communities of China](image)

**Legend:**
- BB: Beibei District
- BH: Baishi District
- BSK: Baisikou City
- CBK: Changbai County
- CHT: Chonghuang District
- CNK: Changshou City
- DY: Dangxiang City
- DG: Dangqing City
- DK: Donghui County
- GC: Gongzhong County
- GH: Guanghan City
- HD: Haidang Town
- HLI: Hailin City
- HHR: Huarou District
- HB: Hefeng County
- HR: Huairou District
- HZ: Hengshou Town
- IA: Jiang'an District
- JNS: Jinjiang City
- JX: Jiujiang City
- JY: Jiaxing City
- LR: Longhai Commission
- LY: Linzhou City
- LUZ: Luozhuang Town
- MAJ: Manji Town
- MJP: Meining District
- MGZ: Manghuzhou Town
- QA: Qia'an Town
- QI: Qihai Town
- QL: Qiling District
- QX: Qingxi Town
- RL: Ruihua City
- RZ: Ruzhou City
- SHJ: Shennbo City
- SHJ: Shennbo District
- SH: Shehe City
- SHH: Shandong City
- SJH: Shandong City
- SIH: Shandong City
- SJZ: Shandong City
- SK: Shangxi County
- SHZ: Shandong County
- SJZ: Shangxi City
- SJH: Shandong City
- SSZ: Shandong City
- SX: Shexian County
- SLO: Shenzhou City
- TBJ: Tainan County
- TBJ: Taining District
- TLI: Tianliang City
- TH: Tianhe District
- TW: Taohua Town
- WU: Wuhu Town
- WJ: Wenzhou City
- WQ: Wuyi County
- XB: Xinhua District
- XB: Xuhai District
- XZ: Xuzhou County
- ZZ: Zhaohou County
- ZJH: Zhejiang City
- ZHJ: Zhejiang Province
- ZZ: Zhejiang City
- ZH: Zhong County
China's sustainable development communities are led and organized by Ministry of Science and Technology and the provincial departments of science and technology, which itself means: first, promoting sustainable development by means of scientific and technological progress and innovation; Second, the governments should play a leading role not only in the technological innovation but also in sustainable development. In addition, since China's reform and opening up in 1978, the basic approach is to establish a market economy and let market mechanism play a basic role in economic and social activities. Therefore, the sustainable development communities must be established on the basis of the market mechanism, and give full play to the government's guidance and role. Specifically in the following three aspects:

First, the central and local governments at all levels and all relevant governmental departments, jointly promote sustainable development communities by means of the horizontal linkage and upper and lower interaction. The so-called horizontal linkage is the Government's science and technology administration departments taking the lead, and more than a dozen government departments of the economy, population, health, education, resources, environment, and so to jointly promote sustainable development communities. The so-called upper and lower interaction is the central government departments to guide local government departments for building sustainable development communities, and the local sustainable development communities to create typical experience, will better promote the central government departments to build the national sustainable development communities, its typical performance is that the provincial sustainable development communities can apply to be national sustainable development communities when they have developed for a few years and achieved success and experience.

Second, the governments make the plan and evaluation index system for sustainable development communities, and promote their development in accordance with the idea of sustainable development. As a case study, Table 1 shows the plan and evaluation index system of national sustainable development community in Wenling City, Zhejiang Province, which has planning targets of 30, involving 7 categories of indicators of the population, ecology, resources, environment, economy, society, science and technology and education. Indicators from Table 1 show the requirements of sustainable development to guide scientific progress and innovation, and relying on technological progress and innovation to achieve sustainable development, thus forming a virtuous circle for innovation and sustainable development.

<table>
<thead>
<tr>
<th>Types</th>
<th>Indicators</th>
<th>2003</th>
<th>2007</th>
<th>2009</th>
<th>2010</th>
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<tr>
<td>Population</td>
<td>1 family planning rate (%)</td>
<td>97.25</td>
<td>93</td>
<td>91.00</td>
<td>90.00</td>
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<tr>
<td></td>
<td>2 the natural population growth rate (%)</td>
<td>4.64</td>
<td>5.06</td>
<td>5.32</td>
<td>5.40</td>
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<td>Ecology</td>
<td>3 the per capita public green area (square meters)</td>
<td>6.45</td>
<td>8.52</td>
<td>9.79</td>
<td>10.50</td>
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<tr>
<td></td>
<td>4 the forest coverage rate (%)</td>
<td>30.8</td>
<td>31.2</td>
<td>31.40</td>
<td>31.50</td>
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<tr>
<td></td>
<td>5 per capita arable land area (mu)</td>
<td>0.43</td>
<td>0.43</td>
<td>0.43</td>
<td>0.43</td>
</tr>
<tr>
<td></td>
<td>6 total energy consumption per10,000 yuan output (tons of standard coal)</td>
<td>0.126</td>
<td>0.116</td>
<td>0.103</td>
<td>0.10</td>
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<td></td>
<td>7 water consumption per 10,000 yuan output (tons)</td>
<td>15.22</td>
<td>11.9</td>
<td>10.60</td>
<td>10.00</td>
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<tr>
<td>Environment</td>
<td>8 industrial wastewater discharge rate up to scratch (%)</td>
<td>93</td>
<td>86</td>
<td>89.00</td>
<td>&gt;90</td>
</tr>
<tr>
<td></td>
<td>9 sewage treatment rate (%)</td>
<td>-</td>
<td>75</td>
<td>80.00</td>
<td>82.00</td>
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<tr>
<td></td>
<td>10 industrial emissions rate up to scratch (%)</td>
<td>91</td>
<td>88</td>
<td>90</td>
<td>92.00</td>
</tr>
<tr>
<td></td>
<td>11 the comprehensive utilization rate of industrial solid waste (%)</td>
<td>96.76</td>
<td>94</td>
<td>96.00</td>
<td>97.00</td>
</tr>
<tr>
<td></td>
<td>12 garbage disposal rate (%)</td>
<td>100</td>
<td>100</td>
<td>100.0</td>
<td>100.00</td>
</tr>
<tr>
<td>Economy</td>
<td>13 GDP average annual growth rate (%)</td>
<td>13.1</td>
<td>10</td>
<td>9.00</td>
<td>8.00</td>
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<tr>
<td></td>
<td>14 per capita GDP (yuan)</td>
<td>21716</td>
<td>31325</td>
<td>36421</td>
<td>39700</td>
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<tr>
<td></td>
<td>15 the local fiscal revenue growth rate (%)</td>
<td>25</td>
<td>19</td>
<td>13.6</td>
<td>13.50</td>
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<tr>
<td></td>
<td>16 the added value of the tertiary industry of GDP (%)</td>
<td>36.1</td>
<td>38.4</td>
<td>39.42</td>
<td>40.00</td>
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<tr>
<td></td>
<td>17 urban per capita disposable income of households (yuan)</td>
<td>14043</td>
<td>18500</td>
<td>20678</td>
<td>22056</td>
</tr>
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<td></td>
<td>18 the per capita net income of rural households (yuan)</td>
<td>6594</td>
<td>8300</td>
<td>9260</td>
<td>9800</td>
</tr>
<tr>
<td></td>
<td>19 registered urban unemployment rate (%)</td>
<td>3.10</td>
<td>3.70</td>
<td>3.90</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>20 tap water penetration rate (%)</td>
<td>84</td>
<td>90</td>
<td>94.00</td>
<td>96.00</td>
</tr>
<tr>
<td></td>
<td>21 basic pension coverage (%)</td>
<td>24.50</td>
<td>30.10</td>
<td>34.07</td>
<td>36.00</td>
</tr>
<tr>
<td></td>
<td>22 farmer social pension insurance coverage (%)</td>
<td>44.79</td>
<td>50.47</td>
<td>54.00</td>
<td>55.15</td>
</tr>
<tr>
<td></td>
<td>23 health workers per thousand population (person)</td>
<td>3.29</td>
<td>4.64</td>
<td>4.48</td>
<td>4.72</td>
</tr>
<tr>
<td></td>
<td>24 cable TV population coverage (%)</td>
<td>99</td>
<td>99.5</td>
<td>99.50</td>
<td>99.50</td>
</tr>
<tr>
<td></td>
<td>25 neonatal mortality (%)</td>
<td>5.40</td>
<td>3.47</td>
<td>2.80</td>
<td>2.50</td>
</tr>
<tr>
<td></td>
<td>26 criminal cases, crime rate (%)</td>
<td>63.8</td>
<td>42.6</td>
<td>34.8</td>
<td>31.5</td>
</tr>
<tr>
<td>Science and Technology and Education</td>
<td>27 financial R&amp;D to total financial expenditure (%)</td>
<td>1.52</td>
<td>2.25</td>
<td>2.26</td>
<td>2.27</td>
</tr>
<tr>
<td></td>
<td>28 the population with tertiary education per 10,000 population (%)</td>
<td>203</td>
<td>340</td>
<td>400</td>
<td>440</td>
</tr>
</tbody>
</table>
Third, the governments adopted a series of incentives, to regulate the role of market mechanisms, and thus make the government behavior to combine with the market mechanism, both to promote innovation and sustainable development. After 30 years of reform and opening up, China's market economic system has been basically established, and the market mechanism is basically interest-driven mechanism. Whether innovation or sustainable development, particularly the promotion of sustainable development through innovation, each has positive "externalities". The market mechanism alone can not get the interest due returns, thus resulting in lack of motivation. From the central to local governments at all levels in China, especially local governments, adopt a series of measures of material rewards and spiritual incentives, indicators and standards, education and training, taxation, finance and technology input and so on to remedy the insufficient of market mechanism, and to promote innovation and sustainable development.

3 Conclusions and New Thinking

Innovation is the means and sustainability is objective (or idea). Innovation services on sustainability and sustainability guides innovation. Both are cause-and-effect, form the positive feedback mechanism, and form a virtuous cycle, thus make both mutual promotion and common development and evolution. However, the positive feedback mechanism between innovation and sustainability can not be formed spontaneously in market economy, and can be formed only by the government behavior combining with the market mechanism effectively.

China national and provincial sustainable development communities provide a lot of typical cases and give effective exploration, including different geographical scope, different resource conditions and different development stages, etc. for the government behavior combining with market mechanism, prompting a virtuous cycle of innovation and sustainability. The practical experience of these sustainable development communities can be summed up in three points: first, the central and local governments at all levels and all relevant government departments can jointly promote the sustainable development communities through the horizontal linkage and the upper and lower interaction; Secondly, the governments can promote the sustainable development communities through formulating the sustainable development plan and the evaluation index system; Third, the governments can regulate the role of market mechanisms, and promote innovation as well as sustainable development through a series of incentives.

Facing the resource and environmental constraints, particularly the challenge of global warming, and facing the high-speed growth trend of China's economic growth in the coming decades, China urgently needs to transform the pattern of economic
growth through innovation efforts to achieve sustainable development no matter from China's own development need or desire from all over the world. Therefore, it is even more need to strengthen the sustainable development communities, and try to play their typical role in the country, and drive the whole nation's sustainable development.

In today’s development trend of economic marketization and globalization, the governments need to play a strong guiding and promoting role in achieving the transformation of development and a virtuous cycle of innovation and sustainability. First, the government should have the correct development strategy. For example, in 1995, the Chinese government put forward the strategy of invigorating the country through science and education and the strategy of sustainable development; in 2006 the Chinese government put forward autonomic innovation as the core of science and technology development and building innovative country as a national goal. Second, the government should take powerful policy. For example, the government should increase R&D investment in green and low carbon technology, strengthen the innovation system of green and low carbon technology, promote enterprises innovation in green and low carbon technology from the standard, taxation, finance and encourage green consumption, etc. In addition, increased cooperation between governments is also very important.

References