Government intervention in developing a circular economy

---A case study of waste management in Sweden

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Abstract: This paper focuses on the roles of government intervention in developing a circular economy. At first a definition and pattern related to circular economy are given. Then a framework of government interventions based on literature is drawn. The framework is categorized into three aspects: state regulation, economic instruments and social balance mechanism. At last a case study of waste management in Sweden is carried out to do some modification.

1. Introduction

Chen Demin (2004) gives followings definition: Circular Economy (CE) is a kind of economic operation pattern in which material resource can be utilized in a circular system including production and life through some means such as cleaner production, market mechanism and social macro-control. It is required objectively by the ecological circular system and its goal is to fulfill the never-ending utilization of material resource and human sustainable development.

Ma Kai (2004) gives another definition: Circular Economy is a kind of economic growth pattern which fits the thought of sustainable development, puts it core to utilize resource circularly through carrying out 3Rs principle with low consumption, low emission and high efficiency.

So the circular economy in simple words: make full use of material resource and lessen the environmental pollution to the most. So the economic growth will be sustainable.

2. The Pattern of Circular Economy

Circular Economy changes the pattern of traditional economy thoroughly. The traditional economy pattern is defined as a unidirectional linear process (see Figure 1). The pattern of circular is defined as a feedback circular process (see Figure 2).

Thus, Circular Economy can reach several goals including a minimization of pollution, a maximization of material resource utilization and at the same time gaining more social and economic efficiency(Ma Kai,2004, Chen Demin,2004).

According to Circular Economy pattern, an ideal circular industry and circular agriculture can be illustrated by Figure 3 and Figure 4 respectively which are generalized according to the characteristics of Circular Economy.

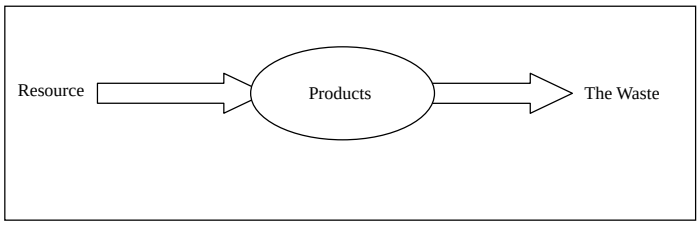

Figure 1 The linear process of traditional economy

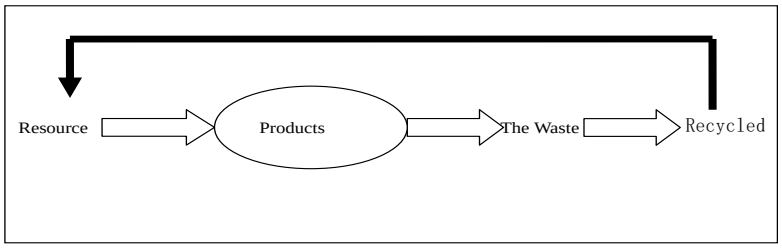

Figure 2 The feedback and circular process of circular economy

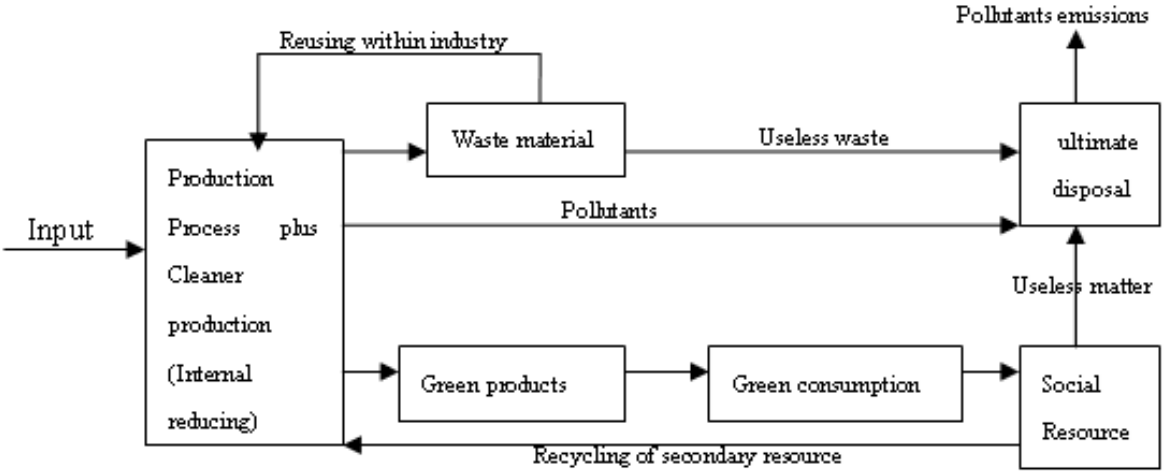

Figure 3 Circular industry pattern

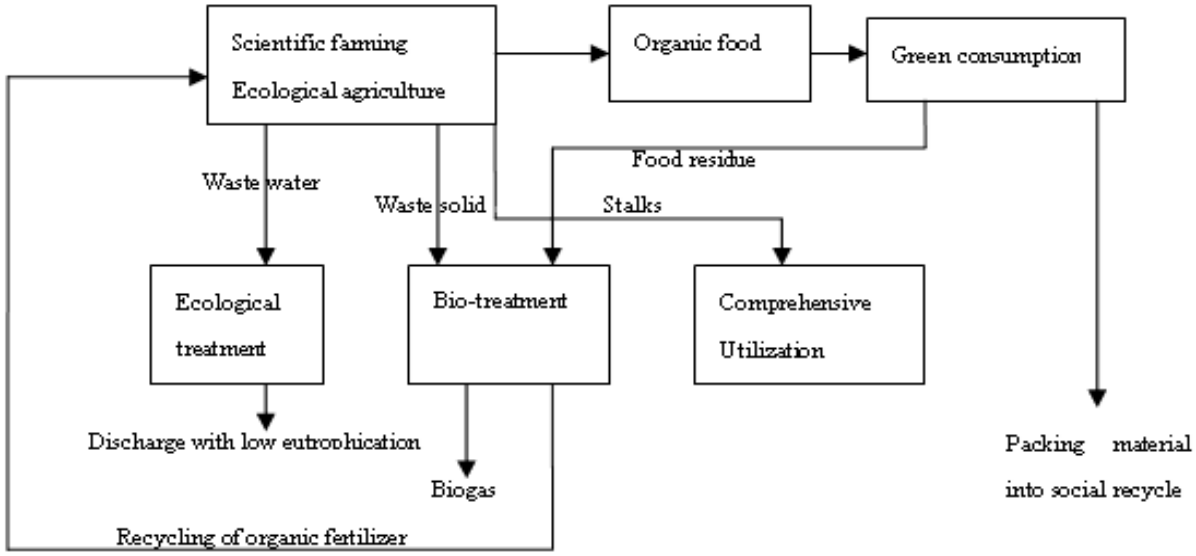

Figure 4 Circular agriculture pattern

3. The Pattern of Circular Economy

The core content of Circular Economy is to reduce the environment pollution to minimization. Usually the economists will category the environment goods into public goods. And environment pollution is good illustration of negative externality. Market mechanism does not work to supply the goods of environmental protection and overcome the negative externality of environment pollution. According to the theory of the second best the government can take the responsibility to fulfill it. Always the environment pollution is a big issue concerning with community, country and even the world. It is difficult to find a solution to reach a Coasian bargaining. Only when the property rights are settled down could the Coasian solutions be effective. Government will be the optimal body to

take care of the responsibility of clarifying the property rights. There is a generation of pollution control instruments (see Figure 5) in the book environmental Economics for Non –economists (John Asafu-Adjye ,1999).

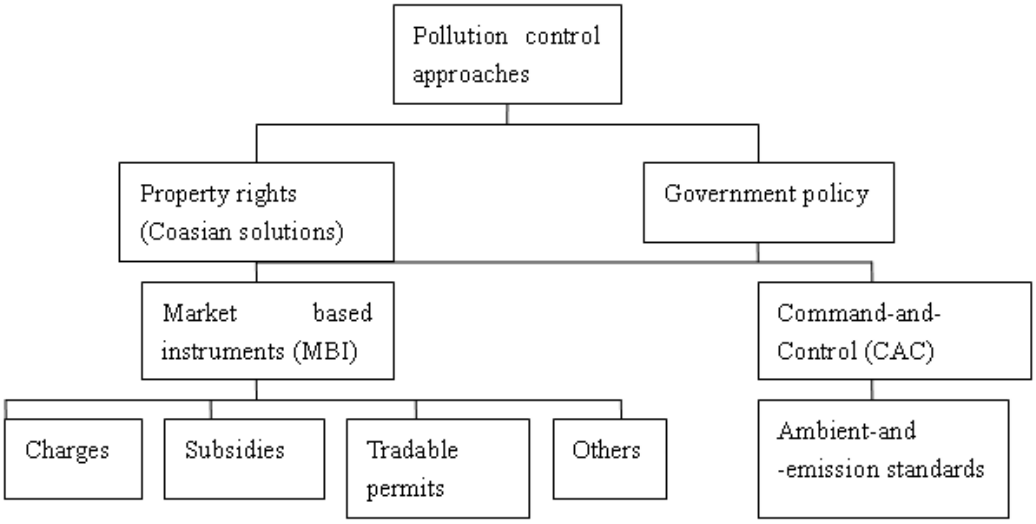

Figure 5 Pollution control instruments (source:Jhon Asafu-Adjave,1999)

From the above graphics we can see all the measure can be integrated into two categories, economic measures and government policy. Also the social balance mechanism is helpful in consumption sectors and nature conservation. We can find the shadow of government in voluntary organization and education program. We are not afraid to say the government should play a very important role in pollution control and the government has cast light on every aspect of environment. A low emission and environmental protection is a main goal of a Circular Economy.

4. What is The Types of Government Intervention?

Deng Zhiming (2002) listed three kinds of government intervention: state regulation, economic instruments and social balance mechanism .

4.1 State Regulation

State regulation means that different levels of governments or authoritative organizations use traditional command and control measures, often through obtaining coercive power by legislation, to manage resource and protect environment. There are three features with state regulation. The main types of it include standard and technical control, control of total emission amount of pollutants, polluter-pays system and environmental impact appraisal system etc.

4.2 Economic Instruments

Governments or authoritative organizations carry through some measures to allocate natural resource and protect environment according to market mechanism in order to overcome the diseconomy of state regulation. These measures are called economic instruments. Its feature is low cost management and high efficient allocation of environmental resource. The main types of Economic instruments include tradable permit, environment tax, and subsidy or grant etc.

4.3 Social Balance Mechanism

To offset the limitations of state regulation and economic instruments, or the so-called market and government failure, people create a social balance mechanism which guides and normalizes polluters' action by emphasizing altruism and public awareness. This part of the dissertation mainly concerns the social balance mechanism promoted by government support such as propaganda and education.

Economic Instruments	State Regulation	Social Balance Mechanism
Permit and Permit Transaction	*Control of Emission standard of pollutants.*	*Cleaner Production*
Environment taxes	*Total Amount Control of Emission of Pollutants*	*ISO14000 Certification*
Subsidy	*The-Polluters-pay principle And polluters-treat-principle*	*Environmental Label Products*
Grant	*Environmental Impact Appraisal System*	*Claims for the Losses of Environment Rights*
Green fund or bail	*Plan control*	*Mass Media Promotion*
		Education promotion

Figure 6 The preliminary framework of go vernment inter vention

So the three kinds of government interventions play different roles in developing a circular economy. And they will interact with each other to fulfill the goals.

A case study of government intervention on waste management in Kristianstad ,Sweden. Sweden, as a developed country, has put the idea of CE into practice for decades in every aspects of the society. And the waste management is the important sector among it. Kristianstad is a major city of Skane and the industrial, service and residential hub of northeast Skane. About 75 000 people live in the city. The Kristianstad region has some of the best agricultural land in Europe and one of the major food centres of Sweden.

4.4 Waste Management in Kristianstad

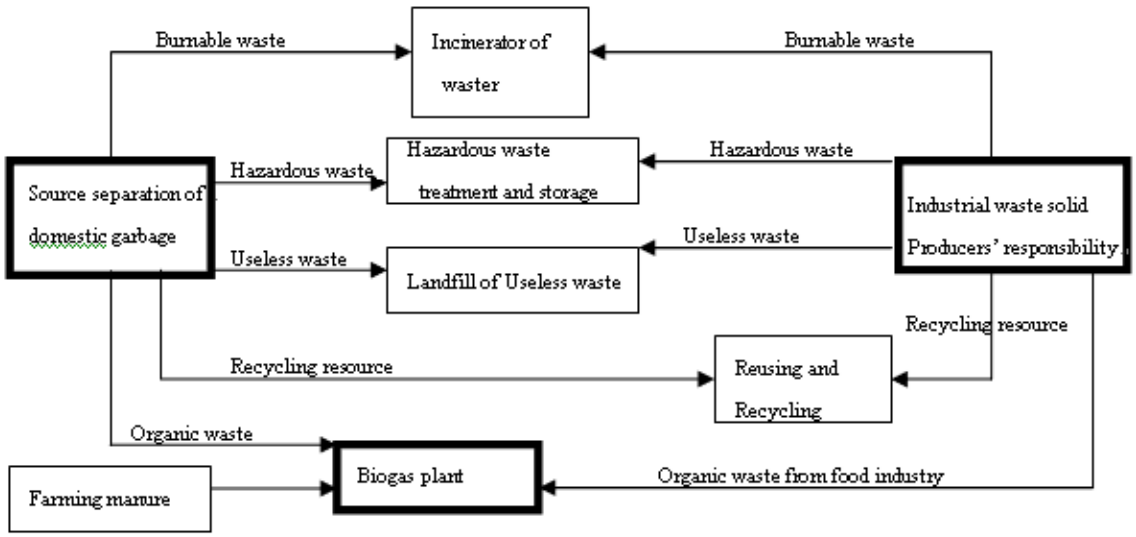

Figure 7 The waste management process in Kristianstad

Waste management process is shown in Figure 7. Here we concentrate on four aspects: general information, source-separation of domestic garbage, producers' responsibility and Karpalund bio-gas plant. Kristianstad has carried out following four principles: Minimization of the quantity of waste solid produced; Reusing and recycling of waste resource as much as possible; Promoting the harmless

and sound treatment of waste; Improving the collection method of waste solid and sanitation conditions.

5. Main Classification and Treatment Methods

Waste solid is classified into ten types: domestic garbage, garden garbage, construction garbage, waste from electric power plants, garbage from industrial waste water treatment plants, waste from the ore industry, special waste from industry, non-special waste and special refuse such as oil, organic solvent etc. There are five different methods to treat above waste:

The recycling waste such as newspaper, metal, glass and wood etc. will be sorted and collected separately, and then sold to professional company for recycling;

Organic waste such as organic garbage from household, farming manure and waste from food industry will be digested for producing biogas;

Burnable waste such as plastics, waste tire, fiber and leather etc will be incinerated in burning plant;

Special treatment waste such as discarded electric appliance and electronic equipment, and cars will be reclaimed in certain site. Then some recyclable material will be sent to a recycling company for further process and the hazardous waste will be sent to special treatment for safe storage;

Non-usable waste such as residues from incineration, construction waste will be land filled with sanitation.

6. State Regulation

Swedish Environment Code and Swedish Waste Management Law regulate the important principles involving waste management. These principles includes: Permit Management, polluters-pay-fee principle, source-separation principle, producers responsibility, 3Rs principle and special operation permit principle etc.

6.1 Permit Management

If any company wants to build a landfill plant, it must apply for a permit from the government. Permits are checked and approved by different levels of authority according to the scale of the planned plant. For a handling capacity being less than 50,000 tons, the company can apply to the municipal committee; if the scale is between 50,000 tons and 100,000 tons, it should apply to the county committee; and if the scale is over 100,000, it should apply to the national environmental court. The authorities will define business sphere, permissible handling capacity and operation time limits as well as the management after closing of landfill. The business for collecting and conveying waste also needs government permission. All companies who engage in waste business must offer statistics and annual reports to relative authorities. Temporary storage of waste before landfill or incineration needs permit.

6.2 Polluters-pay-fee Principle

The protection for the normal operation of waste companies lies in their stable income. The source of their income comprises five parts: the domestic garbage fee is collected by the authority and the authority appropriates certain money to them according to the handling quantity; fee is charged for handling hazardous waste; fees are from hospitals and administrative units; fee is charged to industrial enterprises; fee is from producers' responsibility.

6.3 Empowerment Principle

The new environmental code as well as other regulations, defines the responsibility for different parties in waste management. The parliament empowers its government or relative authorities to draft detailed administrative regulations involving waste management. The municipal authority is also given the power to define the concrete management requirements.

7. Economic Instruments

The principles mentioned above are put forward based on a market economy mechanism. As for the producers' responsibility, producers can exercise their duty by themselves or delegate other professional companies to do it by paying certain fees. This can also happen to the polluters-pay-money principle. Meanwhile, many economic instruments are adopted to promote the management level. The municipal government has changed its role from overall management to macro-control and its concrete management has shifted to public companies. These companies have become the development centre for new management. If the service cost cannot meet the investment, the company has the right to raise the charge rate except for domestic garbage fee which is decided by the municipal authority.

8. Social Balance Mechanism

The raise of Swedish waste management level contributes some part to its voluntary actions. The green groups launch many actions to raise the awareness of the masses. For example, there are 200,000 members in the Swedish natural protection association. Green groups publish their own newspapers and books, independently investigate all kinds of environmental problems and monitor the emissions of industrial enterprises. Many Swedish companies appoint the leaders of green groups as their counsellors to avoid conflicts. When the companies make their plans, environmental problems and waste management will be the inevitable contents.(Table 1)

Table 1 The Framework of Government Intervention in Sweden

The type of government intervention	Concrete Pattern
Regulation	1. Environmental legislation has been implemented via regulatory instruments coupled with systems of monitoring and sanctioning of now-compliance such as producers' responsibility, source-separation, the-polluters-pay principle and polluters-treat-principle, limits in terms of maximum rate of discharge from a pollution source, pollution density limits related to emissions, environmental impact appraisal system and mandatory permit system for new projects. 2. Regulations from international protocol and national implementation agenda. EU and Sweden have signed the Kyoto Protocol and make their objective to reduce the emissions of greenhouse gases by 4% between 1990 and 2010; After Rio E&D conference in 1992, Sweden enacted Swedish 21 Agenda and Local 21 Agenda among which include many regulations such as cleaner energy plan etc. 3. regulations from local authorities such as fossil fuel free municipality program and concrete regulations about source separation, cleaner energy and producers' responsibility etc.
Economic Instruments	1. Environmental taxes such as energy tax, sulfur dioxide tax, NOx tax, aerial tax, vehicle tax, fertilizer & insecticide tax, and tax on Gravel. 2. Tradable emission permit; 3. subsidy and grant; 4. product charge for reclamation of waste products and packing material such as batteries; 5. the-polluters-pay such as garbage fee for household, treatment and operation fee from consigner or producers. 6. deposit-refund for reusable drinking containers and waste cars.
Social Balance Mechanism	1. environmental education such as nine-year compulsory education system and adult education system; 2. Green groups such as national nature protection association. 3. Mass Media Promotion; 4. Claim for Rights from environment loss 5. Environmental Label Products and ISO14000 Certification

9. Summary of Analysis

Based on the above analysis, the framework of government intervention on Circular Economy in Sweden is generalized in Table 1. Meanwhile following six proposals are supposed to drawn:

We argue that state regulation is the foundation and legal protection for the promotion of Circular

Economy. Economic instruments are the best way to allocate natural and environmental resource with high efficiency. If economic instruments want to play its full role, they must be under the protection and support of state regulation. Most of them include the content related to state regulation. State regulation needs corresponding economic instruments in order to reduce enforcing cost and play its full role. There is a possibility that both state regulation and economic instruments are in failures under which social balance mechanism will play its foundational role in building Circular Economy. In each level and aspect of Circular Economy, government intervention will play its best role by the integration of three measures.

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