Business Model for a Low-carbon Economy

Nagoya University  Makoto NISHIMURA*

Abstract: Max Weber predicted in his "The Protestant Ethic and the Spirit of Capitalism" that this cosmos [of the Protestant work ethic] today determines, with overwhelming coercion, the style of life of all individuals born into it, not only of those directly engaged in earning a living but of every individual who is born into this mechanism, and may well continue to do so until the very last ton of fossil fuel has been consumed (Weber, 1989). As according to Weber’s prediction, the world is about to face a serious food and natural resources crisis which may make the global economic system unbalanced. Under the circumstances of such natural resources and global economic related limitation and the necessity for global warming countermeasures, there has been a wider tendency in discussing about the necessity of the newly so-called economic concept "Low-carbon economy". There is a tendency that this concept is achieving a global consensus, as represented by Lester R. Brown’s “Plan B4.0”. It is therefore necessary to create a methodology to implement a low-carbon economy in concrete terms. This paper focuses on how to set up this methodology. We shall discuss about business realities related to our own experiences and Japan’s energy-savings as an application of our business model in a narrow sense, i.e., the concept of profit-generating structure. As a result, due to the difficulty in implementing a low-carbon economy under the mechanism of a freely competitive market, we shall suggest that the internalization of the external regulations and incentives help to design and complete a business model which then enables the implementation of a low-carbon economy.

Keywords: Low-carbon Economy, Business Model

1. The Concept and Application of a Business Model

The term “business model” is used in a very wide range of meanings including the business itself, business system, business design, business style, profit model, marketing strategies and so on. Firms and individuals behave rationally in order to acquire their targets of a sustainable profit, and hence, they will achieve their business targets without interruption. The most suggestively realistic way to implement a low-carbon economy is to make business with the activities and targets of the aforementioned firms and individuals. In this way, our paper employs the meaning of the business model in its narrowest sense as a so-called “sustainable profit-generating structure” from which is

*Nagoya University, Graduate School of Economics Professor
derived the implementation of a low-carbon economy’s business model. The reason underlying this implementation is that firms and individuals trying to create various forms of business presuppose a scheme that raises profit over the long- or mid-term, and such a scheme constitutes the necessary and sufficient condition for business to survive and grow.

From the viewpoints of a series of business model concepts, along with the representative revenue model given by Allan Afuah (2004), A.J. Slywotzky and D.J. Morrison (1999) in “The Profit Zone” suggest the ideas of a business design, especially the phenomenon of a non-profit zone where firms and individuals could not earn profits from their activities. Then, Kago Yashio and Inoue Tachihiko (2004) focus on the idea of a start from zero for a business system among many other business system strategies. Based on these references, our paper discusses how firms and individuals can shift to the implementation of a low-carbon economy given their rationality in business targets and activities, then how to lead them to the profit zone in which they can achieve sustainable profits.

2. Business Model in General

On the premise of implementing a low-carbon economy, it is necessary to clarify whether the concept of a business model for firms and individuals is also valid for a country- or region-level as a “business model in general”. The existence of a general business model, for instance, means not only business activities of a variety of firms in the Japanese economy, but also the general business model for Japan as a whole. However, to figure out the validity of the arbitrary assumptions on creating a business model in the field of a low-carbon economy implementation, we consider the following examples that occurred during the period 1980-2008.

(1) The causal relationship between the major oil producers’ business model and the hike in crude oil prices; and

(2) Soaring grain price caused by the development of biomass ethanol.

As for the first example, the business model of major oil producers vertically integrates all three components of the oil industry: the upstream sector including crude oil exploration and drilling businesses, the midstream sector of oil refining businesses (hereafter referred to as refinery), and the downstream sector of oil product retail businesses including gas stations and kerosene retailers.

![Figure 1: Number of Refineries in the United States of America](Source: IEEJ 2006)

Figure 1 shows the oil-refining capacity of refineries in the United States. The number of refineries dropped sharply in spite of the increasing gasoline demand, and the total refining capacity is barely maintained by the increasing capacity of large-scale facilities. This is caused by the financial situation of refineries. Refineries aim at refining crude oil, then producing gasoline. However, utilizing the same facilities, various kinds of co-products besides gasoline, such as kerosene (including jet fuel), light oil, heavy oil, and residual oil, are produced. However, in the United States economy since 1980, an increase in population, and changes in the industrial structure made demand for gasoline prominent, and demand for co-products sluggish. That is the cause of the unbalance in the US market. As a result, there is a delay in building new refineries as well as a limitation in gasoline produc-
tion which tighten gasoline supply and demand, cause escalating prices, then in turn push up crude oil prices. Such a situation starts to affect the “general business model” of the giant petroleum industry as a whole with its characteristics of the vertical integration. Since the year 2000, the ratio of profit by oil business field (upstream : midstream : downstream) became roughly 8:0:2. Profit expansion of the upstream sector, due to the fact that the more refraining from building additional refineries result in the higher the crude oil prices, show that the giant petroleum industries have been continually increasing their profits. This can be confirmed based on the dimension of value acquisition among business design strategies in “The Profit Zone” (Slywotzky and Morrison, 1999), i.e., rationally facing the method to increase profit. Eventually, a huge sum of speculative funds poured from the financial market into the structure, leading to unbelievable prices—higher than $140/barrel. On the other hand, such an arbitrary change in the giant petroleum industry business model brought about a change called “a general business model” to the US’s farming households. That is the proliferation of biomass ethanol as in the second example.

Biomass ethanol, which is produced from maize (corn), basically cannot be competitive with gasoline, as calculated from their energy density. But as the soaring gasoline prices brought by the aforementioned petroleum industry business model made the production of biomass ethanol profitable, the US farming households all at once started to increase production of biomass ethanol, leading to a dramatic change in the business model. They can not only cast off from the mere dependence on cereals-related market, but more dramatically, they can get out of the excess inventory in the continuous 40 years from 1970 due to commitment of maize in the energy market. Maize itself suffers from quality deterioration if farming households could not sell out. Therefore, the transduction into biomass ethanol is another semi-permanent preservation method for maize. This process which gives farming households more choices under the framework of the so-called “general business model” changes the market price system of maize - i.e.: not only maize, but also wheat, grains, and soybeans skyrocketed all at once. Ultimately, a large sum of money poured from the financial markets into this structure, as in the case of crude oil, leading to the highest grain prices ever as seen in Figure 2 about the International price trend of cereals.

![Figure 2: International Price Trend of Cereals](image)

Source: Ministry of Agriculture, Forestry and Fisheries of Japan Homepage “World Prices Trend of Agricultural Products”

Based on these discussions, we suggest a hypoth-
Business Model for a Low-carbon Economy

3. A Business Model for a Low-carbon Economy

3.1. Why does the transfer of environmental technology not get through?

In this part, we focus on the design of the “general business model” for the implementation of a low-carbon economy in details. One of the most effective methods to implement a low-carbon economy is to practice the method of energy-savings. In Figure 4, we show an international comparison in the consumption amount of primary energy per GDP. We can see that Japan is the most energy-efficient country among all countries. It is considered that if countries throughout the world can reach the same level of energy efficiency as Japan, a low-carbon economy will be immediately applicable. Therefore, it is suggestive that we can meet our target if we can transfer this excellent energy-saving technology of Japan abroad. However, this is only a desk-plan. That is, except for the exportation of fuel-saving Japanese cars and energy-saving Japanese home appliances, most cases of technology exportation do not succeed. In reality, the author was engaged in a business of transferring the leading, most efficient energy-saving apparatuses from Japan to a Southeast Asian country from 2005 to 2007, and experienced a dreadful ending. However, this failure teaches us an important lesson when implementing a low-carbon economy; and it will hence be mentioned in more detail below.

The energy-saving apparatus in question applied the “Hydrate Slurry Air-conditioning Technology” of JFE Engineering Company which was awarded the Energy Saving Prime Minister Prize in 2006. This apparatus helped reduce electricity consumption by about 30–40% if we used it with the existing water-cooled type air-conditioning system. The initial investment was high, but could be paid back in 3–5 years, and after that the savings in electricity expense would generate profit. It was first thought that with the high technological level, and the record of actual performance in Japan, such technology would be easily transferred to Southeast Asian countries where energy usage was inefficient. All participants in the technology introduction seminar, including governmental officials, building owners, building maintenance companies, tenants, environment-related consultants and engineering companies, were amazed at the excellent technology, so that there was no question of whether to import it or not; it was just a question of when. However, the actual condition drastically changed when we started sales operations. The problem was that it was impossible to determine who would be the actor to import the energy-saving technology. Specifically, building owners and maintenance companies got no benefit from the investment because tenants were paying the electricity expense. Similarly, whether tenants would benefit from that investment or not was unclear because they might move out when their lease contracts expired. The government would not subsidize if the actor were not...
decided. Consultants and engineering companies could not provide support for sales promotions when the actor was unclear. Even though Singapore and Thailand depended on external sources of energy, at the period of the year 2005, common consumers showed only one kind of energy-saving trend and it was clear that their concerns to energy-saving were not as deep as in Japan.

Owing to this experience, we derive a hypothesis as follows:

“To carry out energy saving, say, to purchase an energy-saving apparatus, firstly, it is necessary for firms and common consumers to clarify their high interest which is mentioned as the activity to create value in ‘The Profit Zone’. Then, the second necessity is to regulate the one dimension of ‘who’ purchases it in the market’.

To make clear this hypothesis, let us look at Figure 4 again and discuss the reason making Japan the most energy-efficient country in comparison with not only developing countries but also the Western developed countries. Primarily, the main actor group to practice the environmental improvement and energy saving are the common consumers = citizens. We imagine from international conferences and academic conferences that people’s interests in the environment and energy saving are high, but this is just the sense among a tiny percentage of experts amidst the whole population of the earth. The relation between experts and the rest of the people on earth can be imagined as the relation between the heart and capillaries in animal blood circulation. In other words, it is impossible to make blood circulate just by the heart. For example, there are about 60 trillion capillaries in a human being, and these capillaries, especially in the muscles, accurately synchronize to make a human being’s blood flow. Similarly, related to the issue of environmental improvement and energy saving, the people react to experts’ messages, share the sense of an issue, and then start actions.

In Japan during the first Oil Shock not only the government felt a panic, but the sense of emergency was felt by all the people, and energy-saving initiatives were raised by both the government and the people. In comparison with other developed countries, Japan’s level of energy security, especially its low self-supply ratio was related to the magnitude and sustainability of the sense of emergency. After that, enterprises have aggressively promoted the development of energy-saving apparatuses, and consumers have given priority to the purchase of energy-saving products as a response to the “top-runner method” initiated by the Ministry of International Trade and Industry (MITI). Consumers themselves also put their first priority in purchasing energy-savings appliances. That means, a low-carbon economy has been implemented in Japan during this period. As a result of this favorable circulation, Japan has become the top energy-saving nation in the world.

An example of the establishment of environmental consciousness based on shock therapy is the case of the US, when interest in environment quickly spread after Hurricane Katrina in 2005. Actually, facing personnel and material injuries from abnormal weather conditions - the global warming alarm - the US citizens as a whole have started recognizing the importance of environmental improvement. Accordingly, this conscious enhancement lead to the Green New Dealer Program initiated by President Obama’s regime.

3.2. Elements for the Establishment of a Business Model
3.2.1 Mind

It is understood commonly that Japan’s high energy efficiency is based on the high level of technology. However, the true reason lies in the possibility that firms can develop and sell energy-saving appliances and can get profits from that business, i.e., the possibility for the design of the “general business model”. As seen in Figure 5, it actually took 30 years for such sustainable high-energy-efficiency power to work, since enterprises had to develop energy-saving apparatuses,
sell them on the market, and finally get a profit. In other words, the sense of emergency that took hold all over Japan from the First Oil shock enabled the “sustainable profit-generating structure of business model”. This hints at a design for a business model for a low-carbon economy. That is, the development of technology for a possible low-carbon economy is important, but even more important is to construct a mechanism to sell that technology on the market. Here, the point is that the Oil Shock made Japanese common consumers more interested in energy savings. In other words, in the freely competitive market without the existence of such strong interest in which there is no clear clarification of “who” and “how”, it is impossible to design a business model for both the firm side and the individual side - i.e., that there should be a market where there is a strong sense of emergency among common consumers instead of the freely competitive market. The difference in energy efficiency between Japan and other countries lies not only in the existence of technology, but in the difference in the sense of emergency as well. Hence, the first element for purchase of energy-saving apparatuses on the market is the common consumers’ strong consciousness of energy saving. We will call this consciousness “Energy-saving Mind”, and we will call the consciousness of general environmental improvement “Environment Mind”. Once these ways of thinking are widespread enough, they become the most important elements enabling the design of a business model for a low-carbon economy. Therefore, to establish such types of consciousness it is necessary to teach environmental education in everyday life, not only during emergencies like the Oil Shock period.

3.2.2 Regulations

It is difficult to sustain these types of consciousness, because the nature of consumers in a free-market economy is to desire, but the rationale to practice environmental improvement and energy-saving restraints that kind of desire. Hence, these types of conscious-

![Figure 5: Energy Consumption in the Japanese Manufacturing Industry, 1973-2005, (1973 = 100)](image)


ness gradually diminish over time. However, Japan’s ability to maintain an “energy-saving mind” is an exceptional case in which the traumatized “shock” and “panic” exist both in government and among the people for a long time.

In general, such a consciousness is short-lived. Hence, it is necessary to have regulations to rationalize and keep up the consciousness. The point here is the order of procedure: the consciousness comes first, and regulations follow. It is possible that if we set up regulations when the consciousness has not been fully established, such regulations may themselves sink the consciousness into atrophy. An example is Japan’s RPS (Renewables Portfolio Standard) method which regulates the electric power entrepreneurs’ use of new energy. The RPS method contributes to the work of energy diversification and greenhouse gas reduction. However, electric power entrepreneurs, such as power companies, reluctantly accept the rule because their consciousness has not been made ready enough.

Another important role of regulations is to regulate all parties related to environmental improvement and energy saving unitarily. This helps to solve the issue of “who” in the case of transferring energy-saving technology to the Southeast Asian countries mentioned above. Regulations help determine uniformly that
“who” taking responsibility of practicing energy saving, and “who” benefiting from this practice. This is considered to be a crucial determinant in order to make business with energy saving.

3.2.3 Incentives

Once the consciousness is established well enough, both in government and among the people, relevant regulations are set up, and the design of a business model for a low-carbon economy will be put into effect. However, effects of various regulations not only for the above RPS method case but also for other previously established regulations against pollution issues fall into the same trend of dead-end regulations. In other words, business models may have been designed, but their effects may be very restrictive because profits can be attained from only one source of government subsidy. There may be a high effect on the people’s consciousness regarding activities such as separation of home waste, but still, this cannot lead to business when there are more entrants. Therefore, an incentive is requested. Under the circumstances of the Japanese Eco-point method from 2009, regardless of a sharp decline in demand just after the financial crisis, we can see the effect when real sales of eco-electric appliances and eco-cars far exceed the expectation. It can be said that because of the common consumers’ well-developed consciousness they decide to purchase energy-saving products, but they can acquire a better opportunity to purchase if they receive incentives. It is imagined that such an Eco-point method may be more effective if it is linked with some regulations controlling exhaust gas.

3.2.4 Competition Principle

Owing to the Eco-point method, home appliances makers and automobile makers are induced to sell more environment-improving products, or more highly energy-saving products in the market (i.e., they have entered into a competition). This leads to a favorable circulation in which consumers’ consciousness becomes higher and hence increases consumption, and as a result, makers speed their mass production that leads to lower production costs. This Eco-point method is now compensated by government subsidy; however, we can utilize it, and even give the right only to private enterprises in designing business models. The point is to construct a mechanism to promote competition among makers, regions and enterprises. As a result, a low-carbon economy will be in present in a short time.

![Figure 6: Home electrical appliances sales in comparison with the same month in the previous year (Unit: piece, 2009 Jan - 2011 Jun) Source: Ministry of Economy, Trade and Industry](image)

3.3 An Economic Model for a Low-carbon Economy

This part summarizes the discussion above. It is most difficult to design a business model for a low-carbon economy in a general market, say, a freely competitive market. Consumers are likely to purchase the cheaper products if they are commonly standardized products in a freely competitive market. In general, the merit of environmental improvement and energy saving does not match the consumption habit of purchasing cheaper products.

It is necessary that firms and individuals construct a market where the design of a business model for a low-carbon economy is feasible. We call this market structure the “economic model for a low-carbon economy”. An economic model is a prior concept for
a business model. It can be considered as an infrastructure. This economic model is composed of four elements as follows: (environment & energy-saving) mind, regulation, incentive and competition.

There may be a question whether technology itself is a determinant of an economic model. It is exactly that technology is a determinant which makes a business model design more feasible. Strictly speaking, however, it is completely possible to design a business model regardless of the existence of technology or not. That is, if there is a business model and a business in that field succeeds, then, technology itself is not a determinant of a business model design.

This economic model is not standardized. It reflects the diversity of countries, regions and eras; therefore, it must match the respective country, region and era. Otherwise, it will not lead to increasing consciousness in the common consumers. Unification of the central government, local governments, educational institutions, mass media and so on is needed for the establishment and elevation of consciousness which seems to have been applied in Japan during the 1970s – 1980s. Regulations and incentives are administrative tasks, but it is preferable when thinking about diversity to have cooperation from the following four sides: industry, academic research, government and the people. There is a likelihood of thinking of competition as an issue related to firms only. However, in the case of environmental improvement and energy saving, it is possible to create a favorable circulation if there is a mechanism that induces individual prefectures and communities to compete to reach a target level of environment improvement and energy saving.

Once such an economic model is ready, firms enter the market and compete with one another in order to make the design of a business model possible. We describe in Figures 7 and 8 cases where there is and there is not a ready economic model, respectively.

Based on the hypothesis image above, we once again discuss about the effects of the Eco-point incentive in Japan. Once again, from Figure 6 referring to the monthly sales of home electric appliances from December 2009 through June 2010, it is clear that TV sales from the year 2010 are comparatively remarkable in comparison with other home electric appliances. The reason is that the time frame for this Eco-point incentive overlaps the ending time of analog TV broadcasting and the starting time of terrestrial digital media broadcasting. Therefore, there is no other choice that the consumers have to buy new TV. Such consumers' correspondence to terrestrial digital media broadcasting exactly implies effects of the so-called regulation. That is, incentive and regulation simultaneously generate effects by chance. It is impossible to conclude the above hypothesis merely with this example. However,
it can be said to be a powerful example.

4. The Application and Reality of a Low-carbon Economy Model

We have just discussed that it is necessary to set up an economic model which enables a business model for firms and individuals in order to implement a low-carbon economy. Will, however, a "general business model" be created based on the aforementioned argument? Japan itself has achieved its authentic general business model due to the fact that the Oil Shock motivated the country's industries to give birth to the world-top-level energy-efficient products such as cars and home electrical appliances and to export them abroad in the frame work of a successful business model. This, then, was linked to the economic growth in Japan. Japanese makers who uniformly had to take responsibilities of energy saving due to regulations (Revision of the Rationalization in Energy Use law) gained benefits from their sales of energy-saving products domestically and internationally.

However, the possibility for the creation of this business model in some representative countries in the community of Newly Industrialized Countries, say, BRICs is quite low. For, if there is possibility, the author's experienced case for transferring the aforementioned energy-saving technology abroad would have succeeded without troubles. Needless to say, the higher the cost for energy hikes, the highly energy-efficient products become more attractive. However, this attractiveness alone is not good enough. During the 1970s – 1980s, the exported products of Japan were famous for not only their property of energy saving but also for their price competition. That means, there is a high likelihood that the experienced "general business model" will not work even Japan succeeds in their production of highly energy-efficient products under the implementation of a low-carbon economy. Therefore, it is yet crucial to think of a framework to export the business model as a whole.

To implement a low-carbon economy becomes as important as to diffuse this low-carbon economic model throughout the world. It is not normal to force any other country to pursue another country's economic model because such an economic model is considered as the infrastructure of that country itself. However, as we discussed, no sooner or later we will have to implement this low-carbon economy due to the hike in energy cost when the fossil fuel tends to run out.

Therefore, if Japan succeeds in implanting this kind of low-carbon economic model, then other countries will actively emulate which may lead to the establishment of the so-called regional “Smart City”, or “Smart Town”. It is said to be most ideal and effective if Japan takes the initiatives in creating those kinds of establishments and spreading them abroad. Because Japan owns the most excellent environmental technologies as well as energy-saving technologies, it will be more persuasive to employ the effective model of Japan than that of any other country.

From the viewpoint of implementing the low-carbon economy globally, Figure 9 suggests the ideal perspective of the cooperation of the most up-to-date “high-carbon economies” as the United States and China with the owner country of energy-efficient technologies Japan in order to create a global standardized low-carbon economic model.

The United States itself is skilled enough at making necessary regulations and incentives for a low-carbon economic model because it originally has its own achievements in economic policies as well as in economic and environmental improvements. Examples for such regulations are the creation of the Super Fund Tax for lead-free gasoline and Muskie Act. Similarly, an example for incentives is the Investment Tax Credit (ITC) employed under the regime of the President Reagan which promoted the excavation of crude oil and natural gas for the economic recovery. This kind of ITC incentive is comparatively easy to proceed in accordance with the production and consumption of
sustainable energy like natural energy. For instance, there is a high likelihood to set up a so-called global standardized “Eco-investment” in the framework of the low-carbon economic model when we give the wealthy elderly rights to get income-tax and inheritance-tax exemption if they agree to invest in solar-electric and harness wind power generation.

In cooperation with China, the implementation of a highly competitive model employing Japanese technology and Chinese industrial power is not enough. It is suggested to mimic and make use of the Chinese-styled special economic zones which have been accelerating under the mechanism of the large-scale Chinese modernization, then diffuse it to other developing countries.

Still, it is hard to implement this ideal low-carbon economy with the joint cooperation between Japan, the United States and China. However, the establishment of such a scheme itself is a signal to declare the “responsibility of large countries”. If there is any chance for it to be in practice, then the human beings will be liberalized and may achieve a sustainable soft-landing society.

![Figure 9: Carbon dioxide Emission by Country in 2007](http://www.jccca)

Source: Japan Center for Climate Change Actions

5. Conclusion

The globe can be considered as “Spacecraft Earth” flying at hyper-speed under the driving power of capitalism. However, there is a “growth limitation” in it. In other words, this spacecraft will crash once it loses speed due to a slow-down in the rate of growth, or it will crash after operating at such hyper-speed and running out of fuel. The idea of implementing a low-carbon economy was born in the fifteenth century and is the antithesis of capitalism, by which since then mankind’s wealth has been increasing dramatically, and life has been made innovative and comfortable. Such a challenge is not easy for capitalism only on the premise of mankind’s desire. This paper presents an economic model in which mankind performs rationally, as well as one of the methodologies to carry out a low-carbon economy. It is naturally skeptical about the possible implementation of such a scheme. However, Japan itself took its challenge in the Oil Shock period as a utopia and became a wealthy nation in the 1970s – 1980s. It is important to bear in mind the ideas of making not only our own nation but also the whole global society wealthy based on this mechanism. Therefore, to implement this low-carbon economy, we should not only look forward to some environmental supremacist voluntary activities but we have to ensure the possibilities to successfully design a business model for firms and individuals as well as the possibilities to change those business activities into sustainable value-making business.

Notes:

1) According to various references in the field of business models, there is a variety of meanings and concepts. However, in this paper, we adopt this concept in the narrowest sense based on A.J. Slywotzky and D.J. Morrison in “Profit Zone” and Kago Yashio and Inoue Tachihiko in “Business System Strategies”. We thus employ the concept of the business model as “a sustainable profit-generating structure”

2) As regards the relation between technology and business, and that between technology and business model, the author presented his paper “Business Creation and the Design of a Business Model” at the 59th Japan Information and Management Conference held at Nagoya University during 21 – 22
November 2009.

Acknowledgments

This research was supported by Grant-in-Aid for Asian CORE Program "Manufacturing and Environmental Management in East Asia" of Japan Society for the Promotion of Science (JSPS).

References

加藤健男・井上達彦（2004）『事業システム戦略—事業の仕組みと競争優位』有斐閣アルマ

松原清利・松本陽一（2004）「ノベーションの専有可能性—キャノンの事例—」技術科新型企業創生プロジェクトDiscussion Paper Series. #04-05.

鈴木宣弘（2008）「バイオテクノール生産・利用をめぐる経済問題と国際情勢」東京大学農学部第35回公開セミナー要旨集 pp.1-16
http://www.a.u-tokyo.ac.jp/seminar/35-yousisyu.pdf (2012.5.9)

田中明彦・中西俊（2004）『新・国際政治経済の基礎知識』有斐閣


