Adaptation for global warming

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Abstract

Through this writing, the author intends to introduce the significance of the establishment of the endorsed chair for global warming at Center for Environmental Remote Sensing, Chiba University. Then, it focuses on general approach to environmental issues related to weather based on much experience that we have been engaging in production and diffusion of various weather services. Finally, it addresses the possibility that Transportation Weather contribute to reduce environmental load.

Keywords: global warming, weather service, transportation, modal shift, northern sea route

1. The establishment of the endorsed chair and its significance

Joint project between Weathernews Inc. and Center for Environmental Remote Sensing at Chiba University started several years ago. In an effort to enhance research and collaboration between industry and academia, we established the endorsed chair inside the center last fall. We hope this place for the industrial-academic research to be an interface that academic researches are taken advantage of for practical use which contributes to the society.

It has been a while since IPCC report pointed out the possibility that greenhouse gas emission caused by human activities can accelerate global warming. Along the way, effect to global warming has been monitored, and the phenomenon to be ascertained popped up and then studied.

At the same time, announcement of the effects by global warming, and giving research on possible countermeasure and adaptation are also important. Coincidentally, COP15 was held in Copenhagen in December 2009 to discuss scheme of post-Kyoto, which gives me a feeling that proposal of countermeasures / handling / adaptation for global warming and concrete actions to realize them are important and urgent to achieve the greenhouse gas reduction target. We hope more and more people to be concerned about environmental issues including global warming, to recognize it is near-at-hand matters, to deepen understanding on them, to research and verify countermeasures / handling / adaptation for such issues, to propose concrete countermeasures, and take actions to realize the proposal.

Setting up the main theme of the endorsed chair as "Research on handling and adaptation for global warming taking advantage of remote sensing and meteorological / hydrographical information," we give researches related to connection between transportation and weather in particular. More concretely, our ongoing researches are 1) development of the Northern Sea Route through the Arctic Ocean, 2) observation on snow ice on road surface by micro wave in Transportation Weather field, and 3) investigation of effects caused by global warming with remote sensing and numerical model.

Transportation operated outside (Sea, Sky, Road, etc...) is strongly affected by weather on a daily basis, therefore many Transportation Weather services have been provided to reduce such influence for achieving business goals.

Weather service has its history that it has been developing together with transportation (shipping industry and aviation industry). The CO2 emission from transportation activities which has strong connection with weather accounts for 20% of the entire CO2 emission of Japan [1]. This figure shows that it would be great contribution to achieve the greenhouse gas reduction target if the challenge to reduce CO2 emission in the field, therefore we believe proposal of a new service in Transportation Weather field which aspires for contribution to the environment results in global warming prevention.

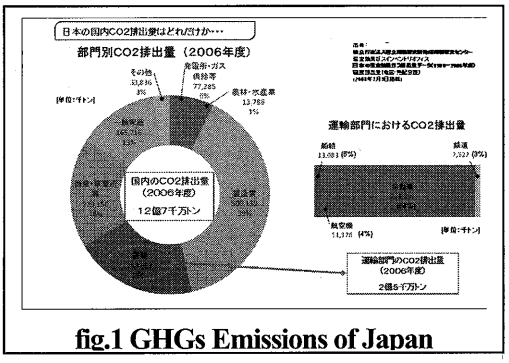

fig.1 GHGs Emissions of Japan

Take the T (Taboo) in the letter G from CHAN"G"E, and

you get CHANCE, meaning that you need to approach the issue without having any "taboo" in mind when you tackle a whole new challenge or value-creation. I strongly believe CHANGE become CHANCE only when there is no "Taboo" in your mind.

Unfavorably, in terms of the discussions regarding the amount of CO2 emission in logistics field, each company insists on legitimacy of one's way of logistics. It follows that there is "taboo" that they don't go into adopting other ways of logistics. The important challenge with collaboration between industry and academia surely needs an idea which is not limited to such vicious trend and taboo. I want to achieve carrying through "Transportation Weather" by industrial academic collaboration.

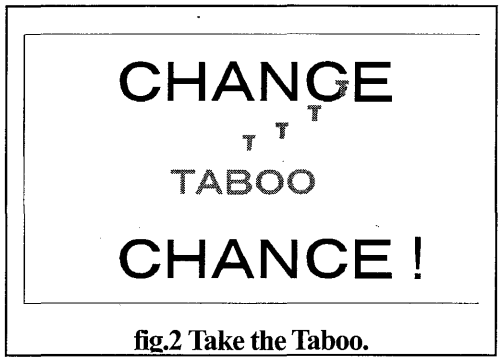

fig.2 Take the Taboo.

2. An approach to the environment issue from the meteorological point of view

Recent increasing recognition and literacy of weather information service have boosted up public nature of weather information, and now its stage has reached to such high level that Weather is advocated to be the fifth public utilities asset following Water, Energy, Transportation and Communication (WETComW). Due to this high level enhancement on public utilities asset, public recognition of weather information is moving from a stage that it is granted to a stage that it is thought to be self-fulfilling management, "weather around you can be predicted by yourself." Meanwhile, weather itself may not be controlled by human being. It is extremely difficult, could be said impossible, to control weather from both technological and economical perspective, like making rain happen or diffusing storms. On the other hand, most environmental issues such as global warming are thought to be stemmed from accumulation of long-term human activities. Therefore, I believe It may be no exaggeration to say "we can control, or at least change, the environment." However, this issue could not be solved by one's understanding or effort. Every single challenge surely needs cooperation by lots of people. One's power is so small that seems it can change nothing. However, its effect can be enormous by cooperating with many people. Given the above, challenges to environmental issues are surely the themes which require public asset management with the mind of helping others succeed.

By the way, I believe that countermeasure and adaptation to global warming should not be discussed in the context of "Saving" but in the context of "Best yield." Economic activities should not be hindered by the notion of "Saving" which brings shrink way of thinking. What is important to this approach is to pursue "Best yield" by eliminating waste, and unevenness, and doing something impossible. To achieve stable economic growth, the countermeasure and adaptation should be balanced, which enables more effective economic growth, while trying to reduce environmental load in the context of "Best yield."

Most industry and economic activities are more or less affected by weather condition in some way such as delay or halt of its works, which degrade best yield. Therefore, many weather services have been provided to reduce such influence for achieving their business goals. By taking advantage of weather service, you can reduce negative effect caused by weather condition, and therefore be able to achieve your business goals more effectively, which definitely leads to "Best yield."

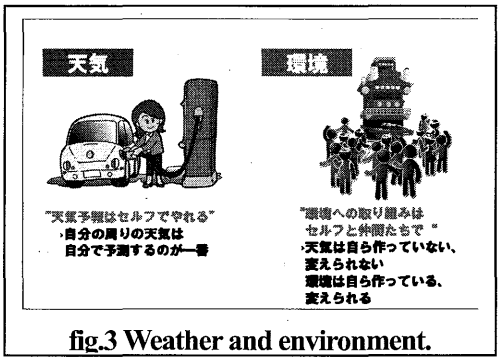

fig.3 Weather and environment.

3. Transportation weather and environmental load

3.1. CO2 Emission load in the Transportation Industry

Total CO2 emission of Japan amounts to 1,270,000,000 ton (in 2006), and 20% of them are emitted from Transportation industry, which is 250,000,000 ton, following Manufacturing industry which accounts for 39% of the total CO2 emission. Looking into the details of Transportation industry, automobiles annually emit 220,000,000 ton (88%), then ships 13,000,000 ton (5%), airplanes 11,000,000 ton (4%), and trains 8,000,000 ton (3%) [1].

Given the statistics above, implementing CO2 emission reduction to Transportation industry, particularly to automobiles, can make great contributions to reduce total CO2 emission of Japan. Therefore, proposal of environment-oriented new service centered at Transportation industry will contribute to counter global warming.

3.2. Modal Shift approach to the domestic commercial logistics among the Truck, coastal ferry ship, train and air transportation (The holistic optimization by Monitoring System)

Expanding our vision form Transportation to logistics, Modal Shift is catching attention as a means to reduce CO2 emission. Modal Shift is alternation of transportation mode, historically from transportation by truck to train or ship which enable mass transportation therefore have less environmental load. After it is presented as a means to energy saving after oil crisis of the 1970's, several effects have been expected on Transportation issues (ease congestions / reduce traffic accidents) and on the environment (reduce gas emission including CO2).

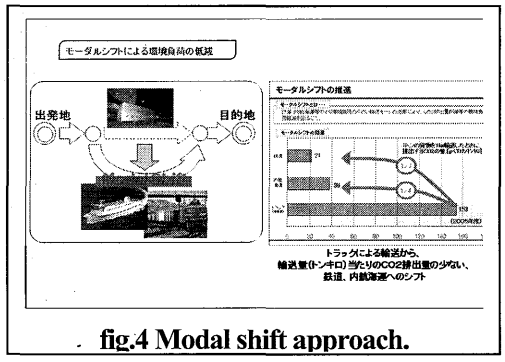

fig.4 Modal shift approach.

Some statistics on energy effectiveness and environmental load of each transportation mode show that trains and ships are superior transportation mode than trucks in terms of environmental load because they need less energy and emit less CO2, which reasons Modal Shift. There was a case that Modal Shift to ferry ships between Kanto Area and Kyushu Area succeed in reduction of 60% CO2 emission. ("Proving experiment to aim at establishment of best transportation mode to the environment", Oceantrans Ltd./Ocean Tokyu Ferry [2]).

According to the statistics on transportation energy directory by Ministry of Land, Infrastructure, Transport and Tourism in 2006 [3], energy consumption of Truck is 2,257KJ/ton-km while Trains and Ships are 528KJ/ton-km and 494 KJ/ton-km, respectively, which means that Trains and Ships need amazingly less energy consumption that Truck, and therefore are more effective transportation mode.

At the same time, CO2 emission of Truck is 0,15kg-CO2/ton-km while domestic shipping and trains are 0,04 kg-CO2/ton-km and 0,02 kg-CO2/ton-km respectively according to some material disclosed by Ministry of the Environment [4]. That means Trains and Ships are also better than Trucks in terms of environmental load.

Modal Shift rate, however, was 55% in 1975, which gradually going down to 35% by 1980, then 40% currently. This stagnation of Modal Shift rate has so many reasons such as traits of each transportation mode, infrastructure, distribution system, industrial structure and so on. Among them, one of the biggest reason is the rapid increase of transportation amount by Truck, which has become four to five times as it was in 1975, going through last thirty years because of enhancement of expressway network and convenience of high frequency retail transportation and delivery service to house. During the thirty years, transportation amount by Train and Ship become just twice.

When it comes to Modal Shift to domestic shipping, main problems are slower transporting and uncertain arrival time. In terms of uncertain arrival time, it is considerably affected by weather and hydrographic conditions. Therefore, heavy weather should be taken into account for operation control. For example, in response to expected weather or hydrographic conditions, you can change speed and route of ships in order to minimize the gap between estimated arrival time and actual arrival time. Additionally, service related to weather and hydrographic information can support coordination between sea and land transportation. Of course, they should be provided in a balanced manner in light both of less environmental load and of certainty of cargo arrival.

To strongly drive Modal Shift, the cargo owners should have the notion of "strategic commercial logistics" by their initiative. Looking back, the suggestions of Modal Shift are from Trains or Shipping industry insisting that they aim at energy saving or gas emission reduction. However, it feels that they end up with fighting for transportation mode alternation for one's favor, without having a view of environmental well-being. To realize the concept of Modal Shift into firm business model, the cargo owners should not be limited to fixed transportation mode. It would rather be expected more flexible and dynamic transportation mode that they choose the best transportation mode in each case by taking into situations (sea, road, airway) consideration while coordinating with several transportation modes, having the viewpoints of achieving business goals and environmental load. That is "strategic commercial logistics." Under the

concept of holistic optimization, the cargo owners, each transportation mode and all relevant people should try to reduce environmental load while dealing with dynamic and transient business environment in order to achieve business goals more efficiently. We need a base for sharing necessary information and for supporting dynamic information sharing, which we call "ECO operations," so that such flexible and quick transportation scheme.

If we look at Modal Shift from the viewpoint of weather-related service, Transportation Weather has almost surpassed the stage to support each transportation mode, and is reaching the stage to realize total optimized logistics by coordinating every possible transportation mode. Not to say decision-making support on transportation mode choice, a lot more service will be needed such as evaluation report on fuel saving or gas emission reduction. I am pretty confident that Logistics Weather service will be established based on Transportation Weather service in the near future.

I can not stop expecting that a new environment-oriented service and therefore a new transportation scheme will be born from many discussions among the cargo owners and relevant people.

3.3. The Northern Sea Route (The new route discovery with the new vehicle)

As a result of recent sharp retreat of sea ice in the Arctic Ocean in summer, feasibility of the Northern Sea Route through the Arctic Sea is getting higher. In response to this, we have established Global Ice Center to monitor sea ice in the Arctic Ocean as a first step to realize the Northern Sea Route.

Due to global warming, an amount of sea ice coverage in the Arctic Ocean records the minimum in 2007, summer. Notably, Canada-side route (Northeast route) and Russia-side route (Northwest route) have been open for the first time ever in the history in 2008. Also, IPCC estimates that there would be no ice in the Arctic Ocean in summer by the end of this century, thus meaning possibility of the Northern Sea Route is getting feasible. In shipping industry, development of the Northern Sea Route would be the second revolutionary incident behind containerization. If the route developed, it would drastically shorten the distance between Asia and Europe by 40%, the distance between Asia and the Atlantic side of North America by 30%. The optimization of sea routes would reduce CO2 emission, thus resulting in counter global warming.

Global Ice Center, which integrates all the information on sea ice in the Arctic Ocean generated by each country under one's jurisdiction, takes on a role to lay out the framework to let a ship safely pass through the Northern Sea Route anytime. We would like to support the voyages by "Ice Routeing," a service for Voyage Planning. More concretely, Global Ice Center collects and integrates information on sea ice in the Arctic Ocean and keeps track of current sea ice conditions, and then anticipation of future sea ice conditions by "I-SEE engine."

Additionally, we are planning to monitor sea ice in the Arctic Ocean from the outer space by a compact satellite whose launch is scheduled for 2010. Beginning from Global Ice Center and the mission specific micro satellite, we are going to challenge the development of the whole new sea route.

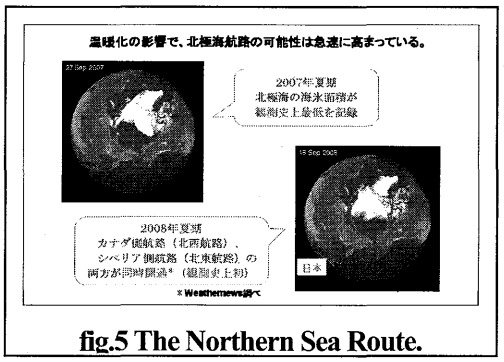

fig.5 The Northern Sea Route.

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