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A SUSTAINABLE THINKING ON GHG EMISION PROBLEM IN MONGOLIA

1.1 Introduction and background

In recent decades, the world has faced the problem of increasing the greenhouse effect. In just 28 years, from 1990 to 2018, the total amount of greenhouse gas emissions in the atmosphere increased from 32 billion tons to 48 billion tons. This means that in just 28 years, the number has increased by 50 percent. That is why the world community is trying to reduce GHG emissions.

When we are talking about the GHG emission, it is very important to understand what we are talking about. The main sources of GHG emissions are:

Globally, the primary sources of greenhouse gas emissions are electricity and heat (31%), agriculture (11%), transportation (15%), forestry (6%) and manufacturing (12%). Energy production of all types accounts for 72 percent of all emissions.

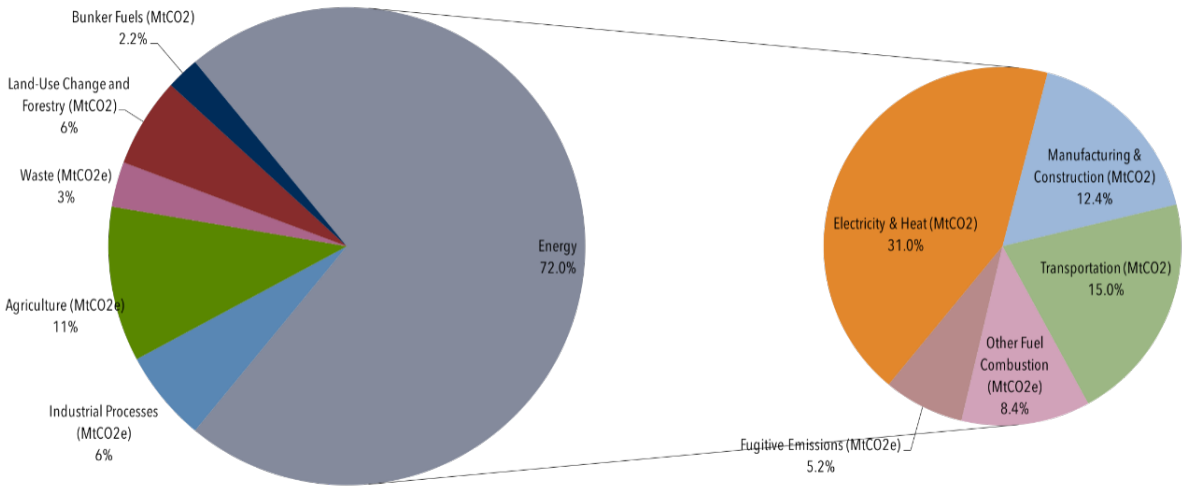

Figure 1. GHG emissions

In fact, animal husbandry contributes significantly to the greenhouse effect because it emits methane and nitrogen oxide. Most of the methane (85%) is generated during the digestion process and discharged by the animals, and some (15%) is emitted from animal manure. Methane is a very powerful GHG, 23 times more potent than carbon dioxide. Therefore, for those countries who have relied economics

largely on stock farming, the problem is stressed around methane emission, together with other GHG emission by the pasture fading. This project raises the issue of greenhouse effects in Mongolia. This problem will be described and researched for further formulation of policy recommendations.

1.2 Problem formulation

During 20 years the amount of GHG emissions have increased from 30 million tonnes up to 50 million tonnes. In Mongolia, Methane emissions from livestock account for 91% of all agricultural emissions and 52% of the country's total emissions contributing to climate change. By the latest SDGS, Mongolia has set a SDG (sustainable development goal) of reducing its greenhouse gas(GHG) emissions by 22.7% by 2030. Fig 2-3 show total GHG emission of Mongolia in the past years, from which the goal of 2030 seems hard to achieve.

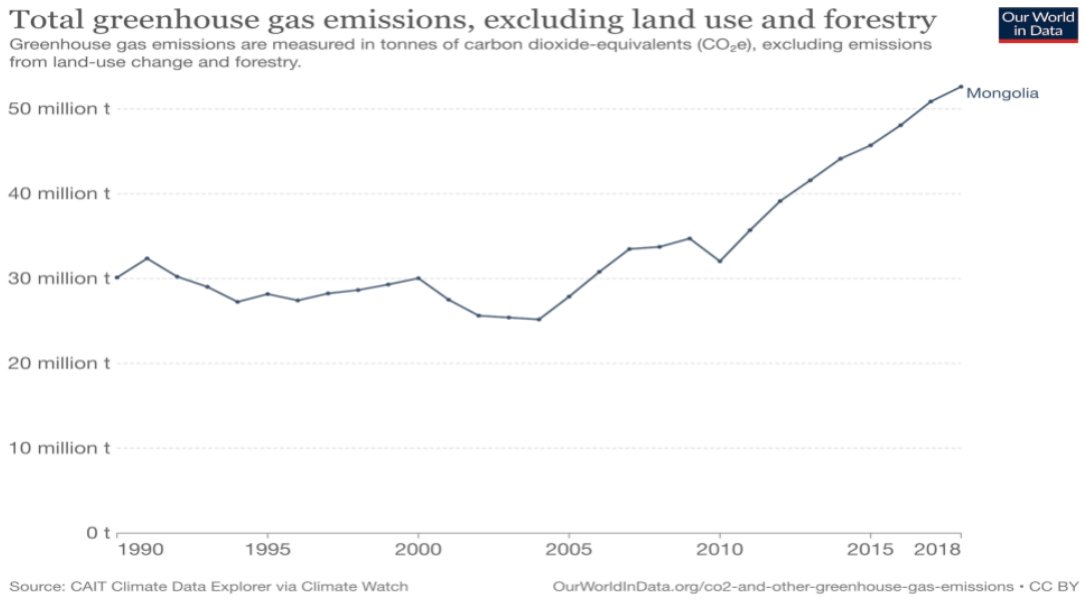

Figure 2. Dynamic of total GHG emission

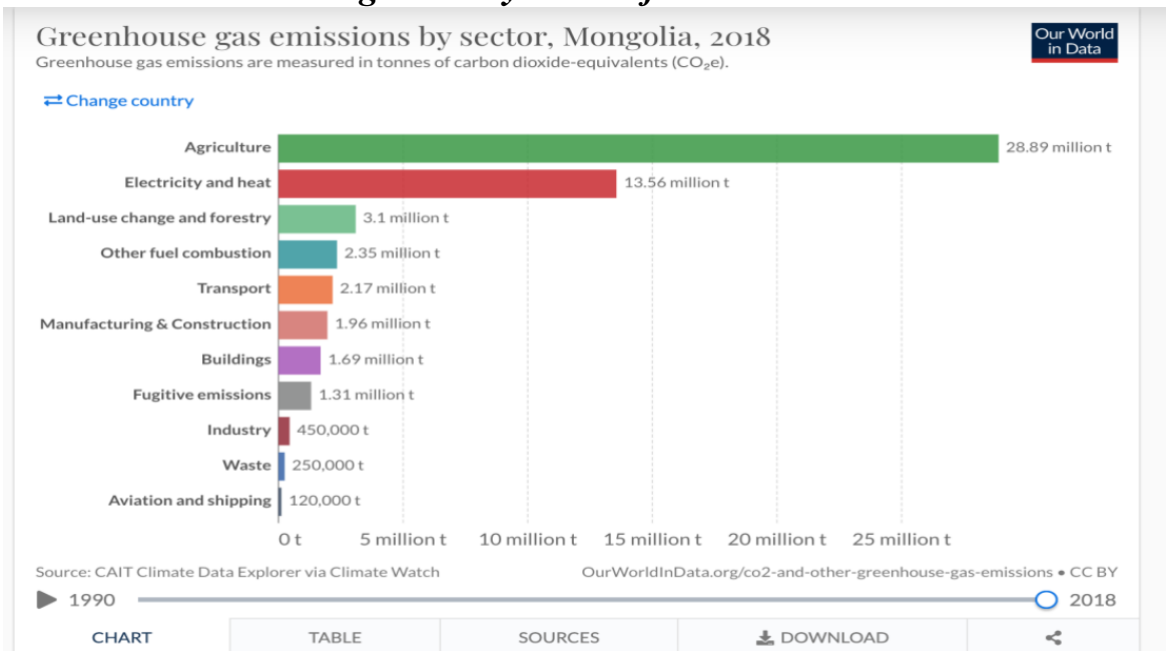

Figure 3. Total GHG emission of Mongolia

2. Hypothesis

2.1 Key performance indicators

After formulating the main problems, we need to discuss the main assumptions for our policy.

1. Assuming the situation without any grazing cutting policy.
2. Assuming the situation using only grazing cutting policy.
3. Assuming the situation with the use grazing cutting policy and other policies aimed to improve livelihood, the economy and the ecosystem.

To speak about all these assumptions, we should represent the Key performance indicators (KPI), which values are the most important, because all them are the part of the sustainability.

Net GHG Emission to atmosphere - it is the net amount of GHG Emissions to the atmosphere yearly, which we are getting after the process of absorption. By or sustainable development goal this value should decrease

Unemployment rate – this is the amount of the adult population who are not working in Mongolia. During the process of implementation policies, we are interested in keeping this value stable.

Income from livestock – it's the income which the government and herdsmen get after the livestock delivery.

Pasture – very important territory which is used for feeding animals. Fading pasture can go to desert or natural vegetation again. A higher GHG level gives a higher temperature and less rain. This leads to the desertification time shorter and time for recovery to vegetation longer.

Water resource, wetland and water in frozen soil – all the water resources of Mongolia, important part of Mongolia's ecosystem. GHG increase would influence both inflow and outflow of water. It leads to less rain that decrease the yearly rising of water

Forest – all the forests in Mongolia. Forests have got direct influence on the process of greenhouses gases emission absorption

1.Assuming the situation without any grazing cutting policy. In this situation we assume that Mongolian government is not using any policies and gives the situation the opportunity to develop as it was. Obviously, this will increase the Greenhouse Effect and increase the problems in the ecosystem.

2.Assuming the situation using only grazing cutting policy. By cutting down livestock scale, to control the emission by grazing animals. The implementation of this policy carries some issues, which should be solved, like increasing the unemployment rate. Moreover the cutting of grazing can be sharply down or gradually approaching target.

3.Assuming the situation with use grazing cutting policy and other policies aimed to improve livelihood, the economy and the ecosystem. This system is similar with the previous one, but also we are recommending such policies as:

Policy investing to other industry. When grazing is cut, some herdsman would lose job. To face this problem, it is assumed that government could promote other eco-friendly industry. It can absorb idle workforce from grazing; on the other hand, promote eco-friendly industry and decrease industry emission.

Policy to increase pc income after cutting the livestock by bringing a high quality of livestock. The falling Income is another problem on livelihood. One recommendation is government help herdsman to bring in better race of livestock, which gives higher unit price, to make up for their loss by cutting. The insight is a higher profit space plus government support on financing and technology can encourage herdsman to decide on livestock of better quality.

Retraining policy. To improve implementation, retraining for grazing people is also recommended. It can raise workers' level in whole industry, also enable herdsman to have modern grazing, which has less damage on ecosystem.

For ecosystem, we have designed policies on pasture recovery, reforestation and water protection. Notice it is hard for ecosystem to restore in Mongolia where natural system is very weak. Vegetation can absorb carbon and water can store carbon and methane, including surface water, wetland and even frozen soil. So, it can balance the whole system.

Policy assumption-pasture: We should give policy to prolong the desertification time and shorten the recovery time from fading pasture to natural vegetation.

Policy Assumption-Forest: one inflow of Planting is added to increase reforestation.

Policy Assumption-water: More scientific water technology is used for grazing and the water depletion from grazing is reduced.

3. Policy Structure

The policy structure is designed around the GHG emission by grazing , ecosystem restore as well as livelihood care after grazing cutting policy. The fig below shows an overview of policy structure.

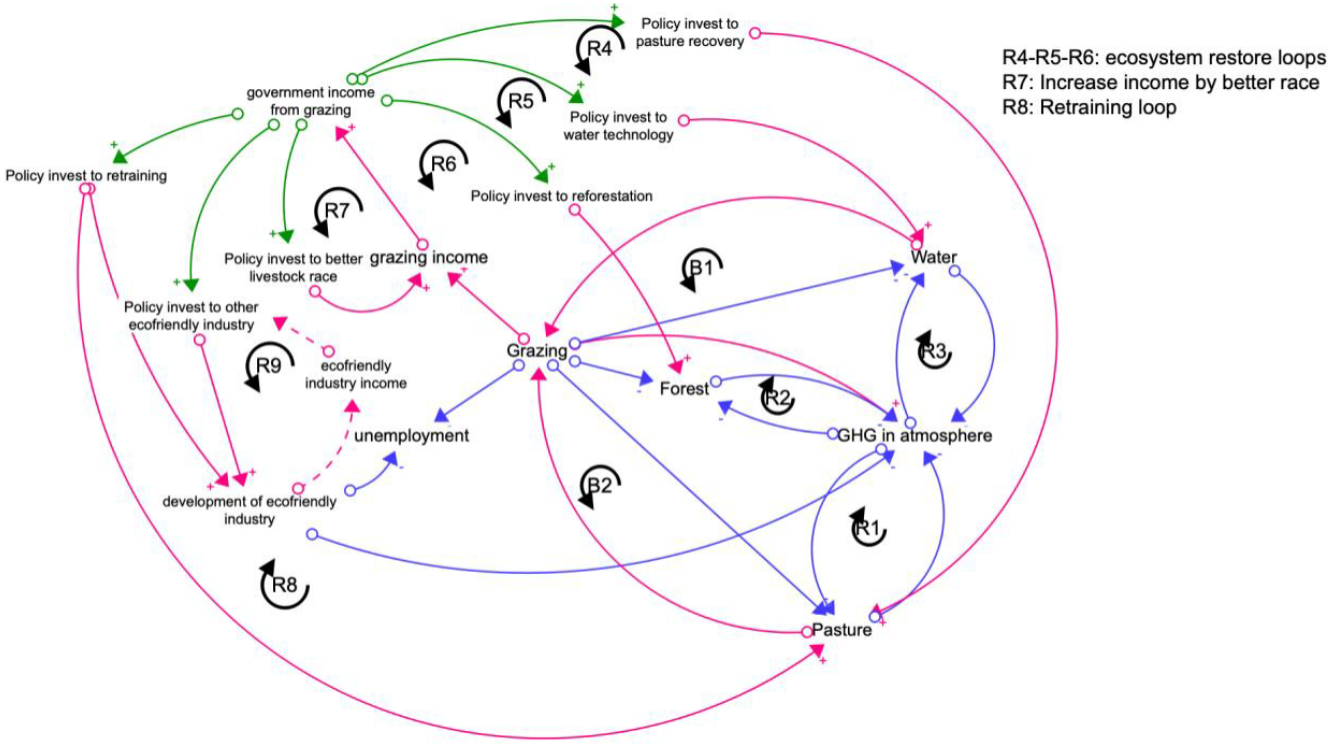

Figure 4. CLD

In the structure, R4-R5-R6 shows ecosystem policy, which is given by more invest on pasture recovery, reforestation and water technology. These loops would have effect on ecosystem (pasture, forest and water resource) and push the R1-R2-R3 to back to equilibrium situation and keeps a healthy circle. If the grazing amount has been limited by an extremely worse ecosystem and resource exhaustion, these restore loops can increase resource capacity, relieve growth limit loop of B1-B2, finally promote grazing scale and grazing income. However, back to our project, Mongolia has not met the problem of growth limit by resource exhaustion but need to reduce grazing to limit GHG in atmosphere. From the sustainability discussion, there would be livelihood problem like grazing income decreasing and unemployment rate increasing.So R7 (better livestock race loop) is used to solve this problem. It shows government could assist herdsman to improve livestock quality to get a higher unit income, in order to improve general income, but not increase grazing scale. Meanwhile, R9 is a hinted loop to solve problem of unemployment rate up by development of other eco-friendly industry, which is not shown completely in our model. Eco-friendly industry development also decreases GHG emissions from total industry.

Finally, Retraining Loop R8 shows improvement effect on development of eco-friendly both and pasture by a new grazing type spread.

4. Uncertainty and limit

The main uncertainty for explanatory model is located in the estimate of effect to climate change by GHG level in atmosphere and how much it would influence vegetation and water. So in the model, we use the year of 2008 as reference year to estimate the relative change for each part of ecosystem.

The structure logic go through by the research on interactions among atmosphere system and other parts including water, forest and pasture.

In the policy structure, the main uncertainty comes from the market demand for livestock in Mongolia and how much effect the invest would have on KPIs. In the model, for example, we assume Mongolia holds a fixed market share of whole world market and give cutting policy. For the better race of livestock, we use profit-cost ratio to compare two different livestock races, and simulate the changing process of herdsman's willing to change a better livestock quality both by different profit-cost ratio and government assistance proportion.

The main limit is we could not achieve more materials about Mongolia grazing, like data on how much interactions among different ecosystem sections as well as the policy implementation, considering the government organization, financing features of Mongolia.

5. Summary and Recommendation

The whole project is firstly surrounded by the GHG emission problem of Mongolia. However, based on the sustainability concept on environment, livelihood and economics, we have to consider it as a complicated interdisciplinary problem. Therefore, we have the following recommendation for clients.

1. GHG emission reduction: To control the process of cutting the grazing gradually, with setting supply goal yearly by clear maximum goal seeking.

2. Livelihood&Economics: To increase Invest to other eco-friendly industry to absorb the idle workforce from grazing industry, in order to decrease unemployment rate.

3. Livelihood&Economics: To provide assistance on financing and technology to herdsman on bringing in Better race of livestock quality with higher unit price, in order to make up for income loss from cutting policy.

4. Ecosystem: To invest to Restore ecosystem.

5. Education: To provide retraining for grazing population, in order to promote Re-employment rate in new industry and spread better grazing type.

Finally, there are DELAYs for all policy. We recommend to plan and arrange the policies earlier than a large scale of livestock cutting.

Although the existence of uncertainty and limits, we believe that the structure has largely reproduced the ecosystem problem in Mongolia by rising grazing in past years and the assumption of livelihood problems by cutting livestock is rational. The combination policies on livestock reduction, ecosystem restore and livelihood problems (income improvement, unemployment problem, retraining) are reasonable and feasible to Mongolia.

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