

Topic No 1.

Basic concepts in Bioenergy

1. Brief Summary

Due to the global energy crisis that happened around the 1970s, development of other sources of energy was born. Sweden and Finland was the pioneer in such development due to the large amount of forest resources that each country has. Nowadays, both countries are the leaders in bioenergy production and innovation. However, not every country has the same resources as these Nordic countries has, so other sources of bioenergy was explored. Currently, there are three main bioenergy sources: (1) wood energy; (2) Agro-energy; and (3) municipal by products. The aim of bioenergy, aside from having alternative source of energy is for a more sustainable source and at the same time decrease harmful environmental effects.

2. Examples / Cases

A district heating plant in Tuupovaara municipality with a capacity of 600kW (see figure 1), which uses approximately 3000 m³ annually of wood chips. The plant operates by distributing the heat generated from a central location, such as the plant, and distributes the heat to residential or commercial buildings for space heating and water heating. The wood chips comes from sustainably managed forests and makes use of residues from thinning and harvesting.



Figure 1. District heating plant in Tuupovaara

3. Perspective/Reflection

I have heard about bioenergy a lot, from lectures and discussions but it was just actually my first time seeing a successful bioenergy plant as this one. We have visited a district heating plant during our trip for the trends of European Forestry course and I remember I was amazed how successful the cooperative was. It is also interesting that the people are shifting from using oil to using this district heating as their heat source. I could learn a lot from such systems and maybe think of a way how it can be introduced to my home country. Since I work as a development management officer it would be interesting to explore other sources of bioenergy which is suited to the Philippines. Because unlike Finland, my country's forest cover is at 29% and there are strategies already in place to increase cover such as putting a moratorium on cutting, hence getting biomass from forests is impossible currently.

Topic No 2.

The Role of Policy on Bioenergy Markets

1. Brief Summary

A policy is a tool to guide decisions, it is put in place to manage and regulate resources which would not have done otherwise. In terms of bioenergy markets, policy plays a key role in establishing the ideal energy mix, wherein aside from using oil or coal, biomass will be used to have alternative sources of energy and at the same time comply with the current international agreements. Additionally, externalities—a consequence, either positive or negative that affects third parties when an economic activity was done, are almost always the reason why policies are created. After all, it is the obligation of the state/government to make sure that benefits are distributed equally and that costs are reduced if not avoided. Currently, bioenergy policy is related to four major policy groups: (1) Climate policy; (2) Energy policy; (3) Rural development policy and common agriculture policy; and (4) Trade policy (Pelkonen, P et al., 2014). These policies have high influence in the development of the bioenergy market.

2. Examples / Cases

In the discussion, we were asked to discuss and answer the following and below are the compiled answer of the class:

Reasons to support bioenergy production	Reasons not to support bioenergy production
Carbon neutral	Not carbon neutral
Available resources	High investments (high costs)
Increase local economy	Can be a driver for deforestation
Presence of existing technology	
Independent energy source	
Diversification of energy source	
Less risks and hazards (soil and water)	

From the table above, we can see that the pros outweighs the cons but only by the number of reasons. We can say that a study should be conducted to really determine the advantages of using bioenergy, but I believe that there are already several studies on the benefits of the using bioenergy and was already proven beneficial hence the shift from oil to biomass as source of energy.

3. Perspective/Reflection

I do agree that policy has a key role in the development of bioenergy market because without the support of the government, bioenergy markets will fail due to high risks and high investment costs. Such is the case of the Philippines, specifically the National Biofuels programme. Because of the change in administration and priorities of the government, investments in the alternative energy sector reduced. The current administration has no clear statement on their stand on alternative fuels but senior officials and presidential press releases has implied that economic development is more of a priority than environmental concerns. Also, the unstable political situation affects the development of the bioenergy market even though a law has already been passed to encourage investments through the provision of tax exemptions and financial assistance.

Topic No 3. Economic Instruments of Policy

1. Brief Summary

Policies make use of economic instruments to influence the market, specifically the demand and supply of bioenergy, in this case. Elasticity plays a key role in the development of bioenergy markets because it shows how economic variables response to changes in the market. Elasticity will help us assess which part of the value chain is receiving the benefits or paying the costs. In this topic, we also discussed various economic instruments, such as capital subsidies, guaranteed market, regulations, quotas, research and development grants, soft actions, eco-labels and promotional campaign. But for this topic, we are focusing on taxes and subsidies. Its effects and the response of the market when these two instruments are used by policy makers.

2. Examples / Cases

To encourage development of bioenergy, market size should be increased and there are there are three tools that can make this happen: (1) subsidy; (2) taxes and (3) others in the form of promotion of bioenergy and policies stimulating competition by decreasing risks or providing feed-in tariffs.

On determining taxes, who should pay for the taxes should always be taken into consideration, Is it the producer or the consumers? It is the responsibility of the state to determine such but the graph below explains the effects of taxes to the consumers and producers. If taxes are increased and consumers has to pay for them, consumption decreases. While, if taxes are increased on the side of the producers production increases due to economies of scale.

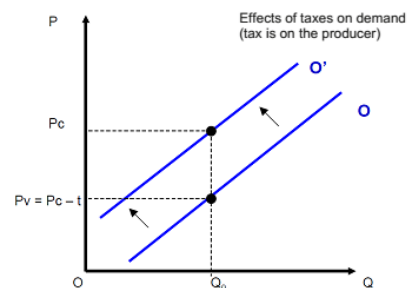
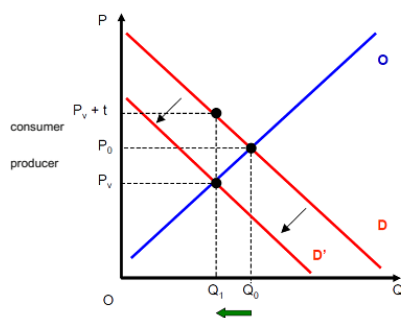


Figure 2. Effects of taxes to consumers (left) and producers (right)

On the other hand, subsidies enlarges the market, the state has to pay/dole out certain amount (see figure no. 2) to reach the target size of production while maintaining equilibrium price or lowering the price so consumers will buy and producers will produce continuously.

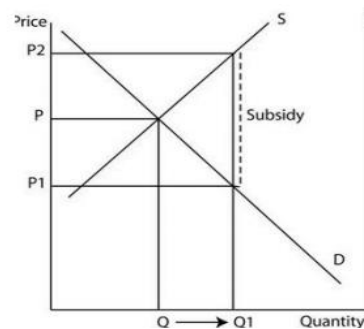


Figure 3. Effects of subsidy to the market

3. Perspective/Reflection

Taxes and subsidies are indeed the most used economic instruments by policy makers because it is effective and beneficial not only to the government but also to the producers and consumers. However, caution should be done in determining who should pay what, because perverse incentives can happen if the case is not properly studied. State can be subsidizing something that can be potentially harmful in the long run. Like in the case of the Philippines, wherein farmers are subsidized in planting coconut for biofuel production. This in turn made farmers plant more coconut and converting forest lands into coconut plantation, thereby increasing deforestation and increasing carbon emission. The said effect goes against the objective of biofuel of decreased carbon emission.

One more thing that I would like to know more is how the state assures that the taxes is being paid by the producers and are not transferred to the consumers in the long run? This has been the issue of protests in my country when the tax reform law for acceleration and inclusion was passed. There is an increase in taxes, for example automobiles where taxes increased from 12% to 32% for premium cars. Car prices definitely increased but how much of the burden was placed in the consumers and how much was placed with the producers? Maybe, it would be better if the state make this transparent and how do they plan to monitor the implementation of the law. People are concern over this matter because every time that the government increases taxes, prices goes up immediately and the same when the government reduces their subsidies.

It should also be noted that research and development as well as promotion is important in increasing market size. Without the proper technology to produce the required products, the aim of the state to increase market for bioenergy will likely fail. And if the people does not know about the product and the reasons behind such decisions it will most likely fail in the market too. I think a holistic approach is needed for markets to develop.

Topic No 4.

Adoption dynamics in bioenergy markets

1. Brief Summary

Technology adoption is an individual choice whether to use the new technology or not. Since bioenergy market is relatively new compared to the oil market and other agricultural markets, the risk of forest owners or farmers is high and the diffusion or spread of the technology depends on individual choices. Hence the government provides subsidies and incentives for them to adopt the technology of producing biomass or bioenergy feedstock. However, even with the incentives provided 100% of the farmers still won't adopt because of various reasons, like age, experience, location, etc. This is explained too by the dynamics of adoption (see figure 3). Based from the graph, it can be seen that people or farmers in

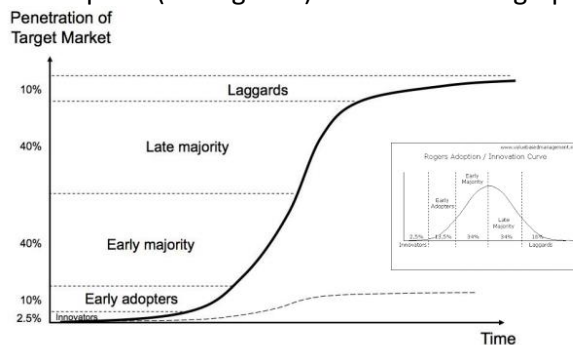


Figure 4. Adoption dynamics curve

this case can be divided into five different profiles, wherein risk takers (2.5%) immediately adopts the new technology. If found beneficial, this will then diffuse to the early adopters, early majority then the late majority. The laggards however will only adopt if and only if the technology is found to be efficient and profitable.

2. Examples / Cases

The adoption dynamics was observed in the town Orebro in Sweden where in the farming of willow for bioenergy feedstock production was introduced and encouraged by the government. In fact, the government provided incentives and research grant and as shown in figure 5, the no of observed number of adopters increased along with the sigmoidal curve of adoption dynamics. However, this is not to say that the diffusion of the innovation was successful because the farmers are just planting willow due to the incentives but what happens when the incentives are removed? Figure 6 shows what happens when Sweden, due to the Cap regulations lowered their subsidies. It can be seen that the commercial plantation establishment increased at a decreasing rate. Meaning the adopters are less than it was before. This could also mean that the subsidies were a failure because it didn't really create a free market.

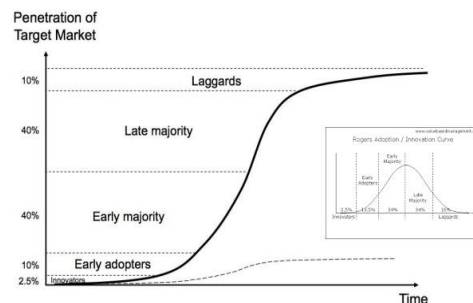


Figure 5. Observed no of adopters of willow plantation in Orebro, Sweden

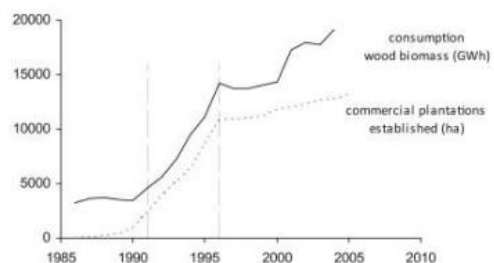


Figure 6. Effects of lowering subsidies, Sweden

3. Perspective/Reflection

This topic was very interesting for me because it was my first time learning about it. I find it fascinating because every new technology will always have its pros and cons and people will always find it difficult to adopt since people are afraid with what they don't know. It is interesting also that there are basically 5 profiles that we can be divided into, and if ever designing a new product or technology, this has to be taken into consideration especially in marketing. Since my previous work involved project development and making sure that this projects are sustainable, I think it will be beneficial if we also look at the adoption side of these new projects so we can assess if they can really be sustainable or not.

On the other hand, I would like to know more on the science or art of providing incentives. For all intents and purposes, subsidies are beneficial and are made to develop the market but people will rely on this subsidies which in the long run is not sustainable, so what then will the government do? Subsidies for a fact ruins the free market competition but without it, new technology will not survive most especially if it is more expensive, in terms of money and time, compared to the usual crops. Behavioural change can be the goal but what are the needed steps to attain it?

Topic No 5.

Biomass Market Behaviour

1. Brief Summary

Biomass market has three major sectors: (1) the forest owners; (2) the dealers and (3) the bioenergy plant. Each sector has its own role and are very important to the flow of the goods and services. The forest owners establish forest plantations and sell them to the dealers; who thin, harvest and transport the biomass to the biomass plants; who in turn process the feedstock to bioenergy. The price and amount of available resources affects the value chain.

2. Examples / Cases

In this topic, the class made an exercise to simulate market behaviour. The class was divided into the three major sectors, the first row was the forest producers, the middle rows are the dealer and the last one are the bioenergy plants. Some simulation went as follows:

- Scenario no 1: Free market competition, although forest owners have differences in terms of amount of biomass and time was not enough for everyone to transact. It resulted to everyone being able to profit with the forest owners having the most followed by the bioenergy plants;
- Scenario no 2: Same conditions as above but now the time is limited. The scenario resulted to dealers not having enough time to transact and being bankrupt. Forest owners having the most profit, while one bioenergy plant was bankrupt;
- Scenario no 3: A policy have been implemented wherein dealers can only increase their margin up to 20%. This resulted to almost 50% of the dealers and one bioenergy plant being bankrupt. Hence policy was not effective.
- Scenario no 4: A new policy was implemented wherein the forest owners has a maximum selling price of €300/unit and dealers can only buy and sell 2 units per transaction. This resulted to everyone having profits although not as big as the ones before.
- Scenario no 5: Monopoly and same policy as above was implemented. Resulted to a bottleneck for biomass hence there are very few resources that went to the plants. Many are bankrupt.

3. Perspective/Reflection

This was a very fun and educational exercise for me because I get to see the market in action and how the policy affects the transactions. Also, even though the policy was good, it doesn't mean that everything will go well. Most of the time, it also has negative effects and that is why policy making can be difficult most especially if the policy makers doesn't have an idea about the situation of the forest owners, dealers and bioenergy plant.

On the other hand, I think that it will be better of other factors were introduced to the simulation like a different commodity, differences in the quality of products, taxation, provision of subsidies and more policies to be tested. I think it will be interesting because in the real world there are so many factors to be considered to have a free market which for me is the most effective.

Topic No 6.

Concepts and approaches to bioenergy governance

1. Brief Summary

According to the Business Dictionary, governance is the establishment of policies and its execution, monitoring and assessment. This is done by a governing body or an organization. It includes established and customary rules that almost everyone follows and it is the responsibility of the government to provide rewards and punishment. In the case of bioenergy governance, there are seven factors that contribute to it and this is shown in figure 7. Additionally, there are the influence of international rules and markets that affects national governance and implementation of domestic rules. Governance results to conflicts and it is their job to understand if not resolve the issues.

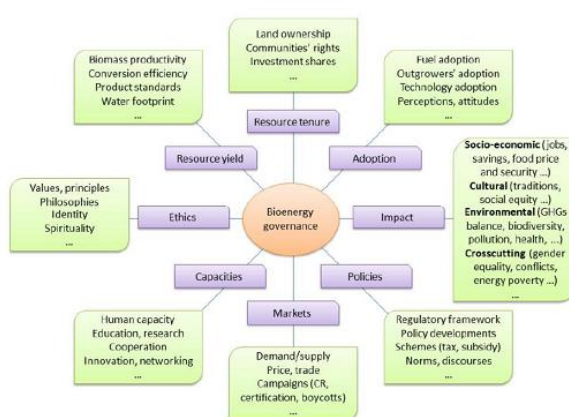


Figure 7. Bioenergy governance framework

2. Examples / Cases

The conflict is centred on a proposed 65,000 ha *Jatropha curcas* plantation for biodiesel by the Canadian company Bedford. The land is underutilized and used for livestock grazing near the Tana Delta system. And it is also considered as a wildlife corridor due to its proximity to the Tsavo East National Park. Ranch owners, local leaders and sector of the communities supports the project however, Environmental Non-Government Organizations are opposing the project mainly because of biodiversity issues and land conversion. Feasibility of the project is also called into question due to lack of market study. Conflict resolution finds that the Government of Kenya should take a more decisive role on the matter because it was found that the local leaders may be abusing their powers. Bedford should have a more participatory process and include more concerned stakeholders, while regulatory agencies should be more transparent on dealing with investors to avoid conflicts such as this. As of 2015, the project is a standstill.

3. Perspective/Reflection

Governance is tricky and not as easy as it sounds and even though all rules are for all intents and purposes, good for the majority, there will always be a negative reaction which is what we call conflicts. In bioenergy governance, there are a lot of conflicts that arises such as prioritization of energy from food. Production of energy crops such as jatropha, willow and poplars can compete with existing resources especially land. Carbon neutrality is still an issue and of course the capacity of the people to pay for new and more expensive energy compared to the cheaper coal or oil alternative.

Topic No 7.

International Biomass Trade

1. Brief Summary

With the EU having a target of 20% reduction of GHG emissions, 20% share of renewable energy in the energy consumption and 20% improvement in the energy efficiency, it is inevitable for countries to comply with the regulation and continue biomass trade or even improve it. Figure 9 shows the biomass streams within countries and between countries. Biomass trade may include all sorts of biomass but mostly it includes wood pellets, forest chips, round wood and other forest products which is used for producing bioenergy.

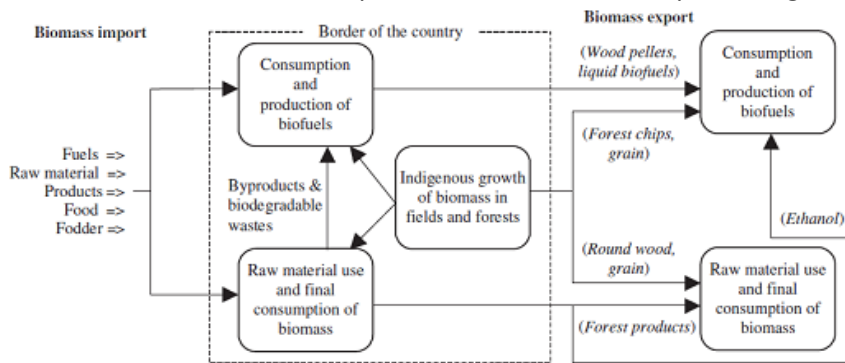
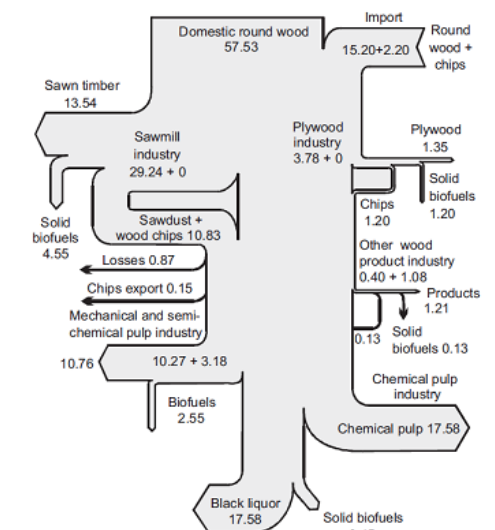


Figure 9. Biomass streams

2. Example/Cases

One good example of a country who has been a pioneer on bioenergy and active in international trade is Finland. Figure 10 shows the summary of biomass stream in Finland. The country imports round wood and chips and transforms these biomass into various by-products, on the other hand the country exports processed products like pulp, paper and chips. To encourage production and consumption of renewable energy, the country provides incentives and subsidies. For wood pellets alone, Finland is producing 42,000 Tons and consumes 22,000 Tons annually, remaining pellets were exported to neighbouring countries.



3. Reflection/Reaction

I've never had experience in using wood pellets for heating and for generating power and it would be interesting to test these and compare with other available bioenergy, just like the exhibit in the borealis lobby. I would also be interested in the available technologies to process these biomass, their cost and benefit analysis and why the government, for instance Finland use peat as source of energy even though it can have negative effects on the environment.

Topic No 8.

Policies for European Commission

1. Brief Summary

Policy tools are used to diminish environmental problems and there are four major categories: (1) fiscal policy; (2) market-based; (3) regulatory policy and voluntary agreement; and (4) policy process. However to have a more effective policy, it is recommended that these categories be mixed. On the other hand, the focus of this topic is on the carbon tax, cap and trade and baseline and credit, which are all methods of putting a price on the carbon dioxide emitted by companies or entities. EU policies include these above mentioned policies and their 20-20-20 target (20% reduction of GHG emissions, 20% share of renewable energy in the energy consumption and 20% improvement in the energy efficiency).

2. Examples / Cases

Oil Company A has been producing 1000MT of CO₂ in 2015. In 2016, Company A merged with Oil Company B producing a total of 30,000GT of CO₂. Knowing that they have produced too much carbon dioxide, company B started investing billions in efficient low carbon technologies. Would you provide incentives for company A and company B? And what kind of carbon tax would you impose?

- I would provide an incentive with company A in 2015 because they have low CO₂ emissions and the incentive may make company a maintain their carbon emissions which is very low compared to other companies
- For company B, I would impose a cap and trade tax, because it would be more effective than carbon tax. They would need to buy carbon credits from other companies to offset their carbon emission. Also, I would like to verify and measure the effects of the efficient low carbon machineries which could also help them offset their CO₂.

3. Perspective/Reflection

I learned a lot from this topic, most especially the way EU is charging taxes to companies emitting carbon dioxide. What I'm interested in though is how countries decide which method to use? As discussed, charging carbon taxes makes small companies pay higher while big companies pay lower taxes. Of course, this is terrible because the more CO₂ you produce the less you pay due to economies of scale, which is unacceptable. But there are countries that uses the method and I wonder how EU is doing about it because in the long run, this carbon will also be affecting the whole world. And it is unfair that one country is doing its part mitigating GHGs but other countries are not, such is the case of China and USA. Which bring us to the same dilemma of these bigger countries not caring about the world while they are two most producers of GHGs, it does not make sense too that smaller and poorer countries has to cover for them. We all know that putting a cap on CO₂ emissions also means halting development using unsustainable means and unrenewable resources. This is what also happened to the Philippines during after the Paris agreement, due to the change in administration, the Philippines who have been active member thought twice about ratifying the agreement, because why would a country whose emission is so insignificant halt its development to mitigate climate change, while a developed country wouldn't? However, if all countries think like this, it would be end, but I just would like to put it out there that highest emitting countries should pay for what they emitting and stop it with the selfishness.

Topic No 9.

Nordic Bioenergy Market

1. Brief Summary

In Nordic countries, the following are the policy support measures for bioenergy market:

- RD&D support
- Economic instruments - Investment grants, Energy and environmental taxes.
- Administrative instruments - Frameworks for monitoring the forestry sector and Enforcing legislation

Since the 1970s, Nordic countries increased their taxes on fossil fuels as means of reducing oil dependence while biofuels have been exempt from taxes, except value added tax (VAT). In Sweden (1991) and Finland (1997) biomass became less expensive than coal.

Finland was the first country to introduce a carbon-based tax in 1990 and has increased subsequently from 1990 to 2005. Fuels used for electricity production are not taxed, but the electricity consumption is taxed. While Denmark obliged explicit CO₂ taxes in May 1992 on energy consumption for both household and business. In Norway, energy tax structure has changed after 1999; and introduced a new separate tax on CO₂, SO₂ and fuel oil.

2. Examples / Cases

Boreal Forest Policies – focusing on Finland where 20% export earnings are from forests and in spite of intensive utilization, forest resources are increasing over the past half of the century. The ratio of wood-based energy has been increasing and accounted for approximately 35% of total energy consumption in 2013. And bioenergy is the main component of the country's renewable energy which constitutes 32% of total energy consumption. And in November 2016, a new climate and energy plan for 2030 was announced which aims to (1) increase the role of forests in both energy production and climate change mitigation; (2) Abandon coal by 2030 for energy; (3) Achieve a carbon-neutral energy system by 2050; (4) Increase the use of forest biomass for advanced transport fuels through biorefining (bioliquids and biogas); (5) Financial incentives (subsidies) to encourage using forest chips and forest industry by-products for CHP and for heating; and (5) operate subsidy scheme for electricity produced from wood chips which will continue at least until 2018.

3. Perspective/Reflection

This topic is very interesting for me because the Nordic countries are pioneer for using biomass as source of their energy and I want to know how these countries do it. And by learning all the strategies and incentives that the government provides to encourage use of renewable energy, it is very clear that governance and policy has a main role. Of course, we cannot discount the fact that the people also made it possible due to their cooperation as well as the available technology. But it should be noted that it is a collective effort and a process. The Philippines, my home country can learn a lot from these policies. As of now, the government plans to review the National Biofuel Programme and the Renewable Energy Strategy and it would be beneficial if the Philippine government consider reviewing their strategy by looking at the strategy of Nordic countries, of course there is a lot of difference between a tropical and boreal forests, but the Philippines can learn from the Nordic countries and maybe improve the existing strategies.

Topic No 10.

Translating EU bioenergy policy: Bioenergy regions

1. Brief Summary

The European commission implements the decision of the European parliament in the form of issuing policies, these policies are broad to cover all European countries. It is then the responsibility of the countries to translate these policies into action plans that is more fitting to their situation and current systems. This is especially true in terms of bioenergy policies, like when the EU issues the EC Biomass action Plan (2005), Renewable Energy Roadmap (2007) and Renewable Energy Directive (2009) and Germany – a bioenergy region translates these policies into their own i.e. NREAP: Nationaler Biomasseaktionsplan für Deutschland (2009); FNR Bioenergy Region Competition (2009-2015); EEG (renewable energy directive) (2009, 2012, 2014) and German Government Energy Concept (2010). It should also be noted that translation is not a value neutral process but based on entities rationalities: policy/ programme mutation.

2. Example/Cases

Bioenergy governance in Norway has high expectations as they have a 67.5% renewable energy target by 2020 and 10% renewables in transport. For electricity, they plan to source 95% from hydropower. This is made possible by various support schemes such as investment funds, chipping grants, etc. On the other hand, their forestry sector is relatively weak which they are planning to utilize and on top of that, but they have very strong electric appliance sector. Hence, bioenergy plays a major role in their operations. To meet their targets, Norway follows their translation framework for bioenergy materialization (see figure 8). According to the figure, there are eight factors affecting bioenergy materialization and these have environmental and socio-economic impacts. According to a study, people are not really interested in energy, they just need it so if the government make bioenergy cheaper, and people will eventually use them as alternative to fossil fuel.

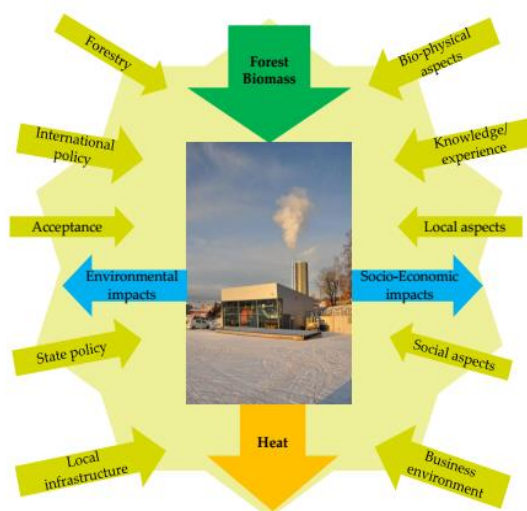


Figure 8. Translation Framework for bioenergy materialization

3. Reflection/Reaction

Proper translation of policies is very critical on this matter, because there can be differences in translating the policy and this can shift the objectives or rationality of a policy. These can happen and sometimes it is not monitored very well. A good policy can therefore be translated into something harmful and less beneficial to the community. In this topic, I would really like to know more about the process of translating EU policies into action plans and concrete strategies and how these bioenergy regions are conducting it. It would be a great experience to know and see for myself how it is done.

Topic No 11.

Recent and future trends in bioenergy

1. Brief Summary

Energy transition from fossil oil to renewable energy is underway in many parts of the world. Renewables stand now for 14 % of total supply, 23 % of electricity generation and more than 50 % of new power generation. A crucial factor behind this is continuously decreasing costs, leading to grid parity of renewable power generation in a growing number of countries. With the increase in population, demand for energy will increase many folds, hence the world is trying to use more renewable sources of energy and is trying to come up with more sustainable sources i.e. solar and wind. While solid biofuels are still a big area in renewable energy (esp. in heating). Liquid biofuels and biogases have long been the only clearly growing segments in it and their share is still very modest. In advanced biofuels, development has been bleak and the future pathway is unclear

2. Example/Cases

The class was tasked to discuss and answer the following:

1) Which factors might have the strongest impact on the future of bio-energy?

Background factors with big impact

- Biofuel technology development
- Oil and bioenergy prices
- Climate change
- Population
- Political tensions
- Lifestyles
- Production costs
- Land use conflicts
- Policies concerning bioenergy sustainability
- Transfer challenges (generation to grid and storage)
- Power generation (and people) out of grid?

Bio energy futures

- Bioenergy getting more important
- Solar PV and wind might grow more than bioenergy?
- Bioenergy might stay important and grow, especially in cold areas where solar energy cannot cover a big portion of the need

2) What is the role of bio energy in the future?

Investment in bio energy depends strongly on:

1. Price level of other forms of energy production (fossil, nuclear, solar, wind etc)
2. Price level of feedstock
3. The efficiency of the production technology
4. The volume of public/state support and the political incentive structures

These factors depend in turn on other factors, such as:

- Energy supply and demand
- Other forms of land use (especially food production)

- The need for climate policy measures (especially cutting carbon emissions)
- Political/ideological goals: energy security, food security, economic interests

Some tentative conclusions:

In land use, food might be a more central function than fiber or energy

If land prices rise a lot, bio energy based on land gets expensive

Renewable energy in other forms can more easily keep its costs down

Scenarios and plans built on large use of biomass for energy contain a price risk

3. Reflection/Reaction

The future is abstract, there are so many factors that can affect it and there is no certainty on the matter. However, by using foresight we can influence the future by planning on what we can do now to achieve our desired future of using more renewable energy may it be from biomass, solar or wind. In this case, bioenergy is only one of the possible future of renewable energy and for that to happen, it needs support from the government and the people. The citizens should make a conscious effort to choose to live sustainably and change their lifestyle in order for this to happen and for a global effect there are more actions to be done.