

The Third Basic Plan for Promoting Biomass Utilization

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Preface: Situation surrounding the use of biomass

(Significance of promoting the use of biomass)

Biomass is a concept that describes the amount (mass) of biological resources (bio), resources that are organic matter derived from plants and animals (excluding fossil resources). Biomass is a sustainable and renewable resource in our life cycle as long as there is life and solar energy, and it is used in a wide range of situations in people's lives.

Sustainable use of biomass as products and energy contributes to the achievement of carbon neutrality by 2050, as well as to the resolution of issues facing Japan, such as the revitalization of rural areas, prevention of global warming, and formation of a sustainable recycling-oriented society.

(Promotion of sustainable use of biomass)

In recent years, people have emphasized the need for the sustainable development of a stable food supply and agriculture, forestry, and fisheries industries, and coexistence the global environment. Amid growing interest in SDGs (Sustainable Development goals) and environmental issues both in the world, there is a need to create an economy and society that develop sustainably. According to the Strategy for Sustainable Food Systems, MeaDRI (Measures for Achievement of Decarbonization and Resilience including with Innovation) formulated in May 2021, it is promoting the construction of a system of locally produced and consumed energy utilizing biomass and other resources, and efforts to recycle local resources in order to achieve decarbonization while reducing environmental impact in the procurement of materials and energy. Furthermore, in April 2022, the Act on Promotion of Business Activities to Reduce Environmental Impact for the Establishment of a Food System in Harmony with the Environment was enacted (Act No. 37 of 2022. Hereinafter referred to as the "MeaDRI Act"). It is necessary to promote the Strategy for Sustainable Food Systems and MeaDRI Act to improve both the productivity and sustainability of agriculture, forestry and fisheries, and to promote the cyclical use and maximum utilization of biomass, which is a regional resource.

(Changes after the enactment of the Second Basic Plan for Promoting Biomass Utilization)

In accordance with the Second Basic Plan for Promoting Biomass Utilization, which was revised in September 2016 (hereinafter referred to as "the Second Basic Plan"), various efforts have been made to achieve the set goals, while promoting measures that lead to revitalization by promoting agriculture, forestry, and fisheries and returning profits to regions by creating region-led projects.

Under these circumstances, the Act for Partial Amendment to the Act on Promotion of Global Warming Countermeasures (Act No. 54 of 2021), which was enacted in May 2021, clearly states carbon neutrality goal achievement by 2050, and it was decided to promote the regional introduction of renewable energy.

In addition, amid environmental pollution caused by plastics becoming a global issue, the Plastic Resource Recycling Strategy formulated in May 2019 set a milestone of introducing about 2 million tons of biomass plastics by 2030, with the goal of promoting efforts to expand the market

for biomass-derived products that contribute to reducing the environmental impact. Furthermore, in April 2022, the Act Concerning the Promotion of Resource Circulation related to Plastics (Act No. 60 of 2021) was enacted in order to further promote the recycling of plastic resources, and expectations for the use of biomass materials are rising.

In the energy sector, the Act for Partial Amendment of the electricity Business Act for the Establishment of a Resilient and Sustainable Electricity Supply System (Act No. 49 of 2020), enacted in June 2020, took measures to build a disaster-resilient power distribution system, and drastically revised the Feed-in Tariff system (FIT system), in addition to launching a new system to add Feed in Premium system to the market price (FIP system). In the 6th Basic Energy Plan approved by the Cabinet in October 2021, biomass power generation is defined as a locally distributed and locally produced energy source, and the act aims to expand the introduction of biomass power generation while ensuring stable procurement and sustainability of biomass fuel.

On the other hand, with regard to biofuels, which are mainly imported, it was indicated to continue to introduce biofuels in light of international trends and technological developments for next-generation biofuels.

(Status of Achievement of the Goals of the Second Basic Plan)

The Second Basic Plan maintains the concept of setting goals in the First Basic Plan for Promoting Biomass Utilization, and presents a society with advanced biomass utilization goal achievement in the future. From the three perspectives of "Sustainable society with lower environmental load," "Revitalization of agriculture, forestry, fisheries, and rural areas" and "Creation of new industries," goals have been set for expanding the use of biomass, formulating a plan to promote the utilization of biomass, and the scale of the biomass industry.

(1) Expansion of biomass utilization

The amount of carbon used in biomass is about 2,400 million tons of carbon per year, compared to the goal of 2,600 million tons of carbon per year. The achievement rate is approximately 92%, and has been remained since the Second Basic Plan was formulated.

The utilization rates set by biomass type are as follows: livestock excrement, black liquor, paper, sawmill residue, construction timber, and forest residue were almost achieved to the target, while sewage sludge, food waste, and non-edible areas were 10% below the target utilization rate.

(2) Formulation of Biomass Utilization Promotion Plans

Focusing solely on the Municipal Biomass Utilization Promotion Plan, 74 municipalities formulated a plan, compared to the target of 600 municipalities, and the achievement rate is low at approximately 12%.

On the other hand, 392 municipalities, approximately 65% of the target, have a plan to serve as indicators for promoting the use of biomass, such as a Biomass Town Project or Biomass Industrial City Project, excluding duplicates.

19 prefectures, approximately 40% of all of the target, have formulated a Prefectural Biomass Utilization Promotion Plan.

(3) Size of the biomass industry

The scale of the biomass industry is about 530 billion yen, including the economic ripple effect, thus the target value of 500 billion yen has been met.

As of 2016, when the Second Basic Plan was formulated, the market size was about 350 billion yen, including the economic ripple effect, and the market size could expand about 180 billion yen over the next five years.

(Evaluation and issues of the Second Basic Plan)

Efforts to promote the use of biomass are generally progressing smoothly, and goals have been achieved to a certain extent, such as an increase in the scale of the biomass industry exceeding the target value and an improving utilization rate of individual biomass.

On the other hand, it is necessary to focus on further utilization of biomass, especially for which the utilization rate of food waste and forest residue is not high.

In order to create a decarbonized society, it is important to make full use of materials not included in the Second Basic Plan such as agricultural residue other than rice straw, rice husk, and straw. It is also necessary to examine the possibilities of using biomass and how to promote it.

Although prefectures and municipalities have not been actively promoting the development of new biomass utilization promotion plans, it is even more important to utilize biomass locally in order to promote efforts nationwide to decarbonize locally. It is expected that biomass generated not only in rural areas but also in urban areas, such as food waste and sewage sludge, is utilized in a manner that meets demand.

With regard to the scale of the biomass industry, under the Fit system scheme, efforts for woody biomass power generation and biogas power generation continue to increase, resulting in about 300 billion yen, including the economic ripple effect. The scale of the biomass industry as a whole has exceeded the target of 500 billion yen and the market has reached a certain size. There are biomass power generation facilities all over the country, and demand for materials is increasing, so the market is expected to continue to expand in the future.

However, most raw materials for biomass plastics, chemical fertilizers, and biofuel are imported. As a next challenge is needed to promote further use of domestically produced biomass, leading to the revitalization of areas.

Under these circumstances, technological innovation is expected to further increase demand for biomass utilization. Regarding the applicable technology described in the MeaDRI and the Current Status and Roadmap of Biomass Utilization Technologies (hereinafter referred to as the "Technology Roadmap"), it is important that innovations that are likely to be implemented in society bring about the creation of a biomass industry through the use of domestic biomass.

In formulating this Basic Plan, the basic direction of measures to be taken in the future was clarified with these issues in mind.

Section 1. Basic Policy on Measures Regarding the Promotion of Biomass Utilization

1. Comprehensive, integrated, and effective promotion

Japan is rich in biomass because of its warm and rainy climate conditions. However, because biomass, such as agricultural residues, are spread wide and thin, it is important to use them in a more economically efficient way. For this purpose, it is important to establish an efficient collection system and utilize it for a wide range of applications, and to comprehensive initiatives to use biomass effectively.

Therefore, it is promoting the construction of a comprehensive utilization system in which all stakeholders collaborate to implement policies. The stakeholders includes biomass suppliers such as agriculture, forestry, and fisheries operators that manufacture biomass products, local financial institutions, academia, local governments, and related ministries.

2. Prevention of global warming

Climate change is a global issue that is solvable by cooperating with other countries. At the 203rd extraordinary session of the Diet in October 2020, the government of Japan (here in after referred to as GoJ) announced that it would aim to achieve carbon neutrality and a decarbonized society by 2050. In addition, at the Climate Summit held in April 2021, GoJ announced that it would aim to reduce greenhouse gases by 46% from fiscal 2013 related by fiscal 2030 as an ambitious target consistent with its long-term goal of carbon neutrality by 2050, and is continuing to take on the challenge of achieving a level of 50%.

In October 2021, the Cabinet approved the Global Warming Countermeasures Plan, which outlines the path to achieve the new goals with actions and measures to support the new FY2030 reduction goals. The Cabinet also approved the Long-term Strategy as a Growth Strategy Based on the Paris Agreement, which describes the basic concept and vision for achieving carbon neutrality by 2050. In the same month, the Ministry of Agriculture, Forestry and Fisheries (MAFF) revised MAFF's Global Warming Countermeasures Plan to implement measures to mitigate climate change in the agriculture, forestry and fisheries sector, taking into account the MeaDRI.

At the 26th session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP26) held from the end of October 2021, an agreement was reached on the implementation guidelines for Article 6 of the Paris Agreement, and a global methane pledge was launched to reduce global methane emissions by 30% from 2020 by 2030. In addition, the Working Group III contribution of the Sixth Assessment Report by the Intergovernmental Panel on Climate Change (IPCC)—released in April 2022, marking the first report by them in eight years—indicated that “Global greenhouse gas emissions in 2030 related to implementation of nationally determined contributions (NDCs) announced before COP26 are likely to exceed 1.5 degrees Celsius in the 21st century.” The world has once again been called upon to further accelerate climate change mitigation measures.

Carbon dioxide emitted by burning biomass is absorbed from the atmosphere through photosynthesis during the growth process of living organisms, and biomass has the characteristic

of carbon neutrality, which means that it does not add carbon dioxide to the atmosphere. By promoting the use of biomass and replacing products and energy derived from fossil resources with those derived from biomass, it is reducing the emissions of carbon dioxide, one of the greenhouse gases, and contributing to the prevention of global warming by creating a decarbonized society.

3. Formation of a recycling-oriented society

Conventional lifestyles of mass production, mass consumption, and mass disposal cause concerns about the depletion of natural resources, particularly fossil resources, destruction of nature by large-scale resource extraction, global warming due to greenhouse gas emissions, and inhibition of proper material circulation in nature. The issues are becoming increasingly serious on a global scale and are overlapping each other.

For this reason, it is necessary to further promote the transition to a recycling-oriented society in which the consumption of natural resources is restrained and the burden on the environment is reduced as much as possible by reviewing the existing state of society and the lifestyles of the people, and ensuring a higher level of material circulation in society.

Based on this idea, in accordance with the basic principles set forth in the Basic Act on Establishing a Sound Material-Cycle Society (Act No. 110 of 2000), it is comprehensively promoting the reduction, the reuse, and the recycling of waste, and heat recovery, and it is accelerating the transition to a circular economy by further promoting the comprehensive use of biomass while considering the sustainability of entire life cycles.

4. Industrial development and strengthening of international competitiveness

By fostering environmentally friendly industries that utilize biomass for products and energy sources, developing innovative technologies and products, and creating pioneering business models, and doing other initiatives, it is contributing to fulfilling the Green Growth Strategy which is creating a virtuous cycle between the economy and the environment. It supports the creation of new growth industries, the energy transition on the demand side, the transformation of an economy and society centered on clean energy, the transformation of the industrial structure, and the decarbonization of areas and lifestyles.

5. Revitalization of rural areas

The utilization of biomass, which is abundant in rural areas, is one of the important initiatives of the sixth industrialization of agriculture, forestry and fishing villages, which promotes the development of regional businesses and the creation of new business categories by combining the primary industry of the region with the related secondary and tertiary industries.

It is important to use locally available biomass to create sustainable businesses with local initiatives, and to link the economic value generated from them to the promotion of agriculture, forestry and fisheries and revitalization by returning profits to the region. It creates vibrant rural areas.

6. Maximum utilization of biomass according to the characteristics of each type

In order to maximize the use of biomass as a resource, it is important not to simply burn biomass, but to reuse it as much as possible in order of value as a product, taking into account its economic efficiency and the reduction of greenhouse gases through the Life Cycle Assessment (LCA), and to use energy by burning it in the final stage. With this in mind, it is promoted the establishment of a utilization system that maximizes utilization of biomass according to the characteristics of each type and composition, for instance, forming utilization technology systems for each stage of biomass.

7. Diversification of energy sources

The international energy situation has been unstable in recent years, and in Japan, which lacks energy resources, it has become important to diversify energy sources from the viewpoint of energy security and other perspectives. In the 6th Basic Energy Plan (decided by the Cabinet in October 2021), biomass power generation is positioned as a source of "having value as a locally produced and locally consumed energy source." In light of this, it is promoting the use of biomass power as a source of renewable energy that contributes to strengthening Japan's energy security while paying attention to ensure a stable and sustainable supply of energy and its economic efficiency.

8. Promotion of regional initiatives

In order to promote the use of biomass, it is important to build a regionally distributed utilization system that efficiently uses biomass as products and energy in the region. It is also important that it expands the virtuous cycle of the local economy and strengthens the resilience of the region by allowing it to secure energy autonomously. Therefore, it is important to have certain facilities to handle biomass in consideration of their characteristics such as high water content, space efficiency, and low shelf life, while also considering the regional biomass supply capacity and demand competition.

In addition, in order to promote an integrated system that ensures economic efficiency, it is effective to comprehensively utilize the biomass generated in the region in a manner that meets demand.

For this reason, it is promoted the comprehensive use of biomass according to local situations in order to respond to regional issues, such as the formation of resource circulation and the revitalization of regional economies in response to new demand in both rural and urban areas.

9. Fostering social momentum

In order to promote the use of biomass smoothly, it is important to build a comprehensive system with a view toward the production and use of biomass. For this purpose, it is essential to obtain the understanding and cooperation of all stakeholders involved in the use of biomass. Since the use of biomass is effective as one of the measures to reduce greenhouse gas emissions, it contributes to forming a recycling-oriented society and revitalizing the local economy, and is leading to the improvement of people's well-being. It is important that biomass is closely related to the lives of

the people. It is promoted social momentum for citizens to voluntarily and proactively engage in the use of biomass and to change the value structure of demand by disseminating it in a way that is easy for local residents and consumers to understand.

10. Ensuring a stable supply of food and timber

Disorderly use of agricultural, forestry, and fishery products in the production of biomass-derived products and energy reduce the supply of agricultural, forestry, and fishery products necessary for other purposes, leading to higher food prices and unstable timber prices. In particular, due to the rapid development of woody biomass power generation, there is tight supply and demand for woodchips in some areas, and there are concerns about hamper supplies of existing materials.

To this end, it is promote the use of biomass while striving to balance the use of materials and energy and taking into account the stable supply of food and the rapid and significant impact on the use of timber and wood products in the existing timber and wood products manufacturing industry, livestock industry, and other related industries.

11. Consideration for environmental protection

Biomass is a sustainably renewable resource produced by living organisms. However, if excessive biomass production, procurement, and use are carried out that disrupts the balance of the ecosystem, not only it impair the sustainability of biomass, but it is also adversely affect the surrounding biodiversity and other natural environments.

With this in mind, in promoting the use of biomass, it has to conserve the environment, ensure biodiversity, protect and manage wildlife, and promote the establishment of a sustainable recycling-oriented society by maintaining a balance between production and use of biomass while considering other environmental conservation issues.

Section 2. Goals to be achieved by the government for promoting the use of biomass

1. Society to be realized in the future

When setting the goals, it is envisioned an ideal future society with advanced biomass utilization, proposed a vision for a society in which the use of biomass has progressed, and set the goal of fulfilling it by 2050 by promoting the systematic and efficient use of biomass. It has set forth the following goals for achieving that vision by 2030.

- Create a sustainable society with low environmental impact (build biomass refineries that systematically produce various fuels and products, replace chemical products derived from fossil resources with biomass products, and build a sustainable social system)
- Create a new industry and revitalize rural areas (produce high-value-added products from biomass, contributing to economic development, and expand biomass supplies, revitalizing rural areas)
- Promote voluntary regional efforts (promote efficient use of local biomass with higher economic value through cooperation with relevant parties such as agriculture, forestry, fisheries, businesses, municipalities, financial institutions, and academia)
- Change consumer behavior so it is centered around the use of biomass (accelerate the growth of the biomass industry by progressing the selective use of products and energy according to changes in the people's awareness)
- Utilize biomass through international cooperation (contribute to establishing a sustainable biomass utilization system in the international community)

2. Way of Thinking behind the 2030 goals

It set numerical goals to achieve by 2030 based on the following concept from the viewpoint of achieving a future with advanced biomass utilization.

- The goal is to expand the use of biomass from the perspective of building an integrated system that ensures economic efficiency, such as a biomass industrial city, by comprehensively utilizing biomass generated in the region, toward the creation of a sustainable society with low environmental impact
- A goal for the formulation of the Biomass Utilization Promotion Plan with the aim of making biomass available to all municipalities, including urban areas, toward the revitalization of agriculture, forestry, fisheries, and rural areas, promotion of local and proactive initiatives, and transformation of consumption behavior centered on the use of biomass
- Goals regarding the scale of the biomass industry, in order to create new industries, from the viewpoint of a biomass industry that implements innovations that use biomass
- It are not set any numerical goals on biomass utilization under international cooperation

3. Goals for 2030

(1) Expand the use of biomass

Expanding the use of biomass is expected to replace products derived from fossil resources

with those derived from biomass.

Although the amount of waste biomass is decreasing over the medium to long term, it is conducting a survey on the reserves and consumed amount of biomass that has not been dealt with yet in the Basic Plan from the viewpoint of maximizing the utilization of biomass resources. Based on the survey, the applicable biomass types is expanded, and the aim is to use approximately 80% of the yearly biomass output.

It set the following goals for each type of biomass and promote sophisticated use that creates more economic value while considering existing methods of using them.

Type of biomass		Current yearly emissions (*2)	Current utilization rate	Goals for 2030
Waste-derived	Livestock excrement	80 million tons	86%	90%
	Sewage sludge	79 million tons	75%	85%
	Recycled sewage biomass (*3)	—	35%	50%
	Black liquor	12 million tons	100%	Almost 100%
	Paper	25 million tons	80%	85% (*5)
	Food waste (*4)	24 million tons	58%	63%
	Sawmill residue	5.10 million tons	98%	98%
	Waste of Construction timber	5.5 million tons	96%	96%
Unused	Inedible produce parts (Excluding those from plowing)	12 million tons	31%	45%
	Forest residue	9.7 million tons	29%	More than 33%

Note 1: The current amount generated yearly and utilization rate were compiled in April 2021 based on various statistical materials (including estimated values for some items).

Note 2: Dry weights are used for black liquor, sawmill residue, and forest residue. Wet weights are used for other biomass types.

Note 3: The recycling rates show the percentages of organic matter in sewage sludge used for energy and green farmland.

Note 4: The utilization rates of food waste (food waste and materials with value) were revised to include heat recovery and other factors.

Note 5: The target value differs from the target value for the waste paper utilization rate set in the Ministerial Ordinance on Decision Standards based on the Act on the Promotion of Effective Utilization of Resources (Act No. 48 of 1991).

① Livestock excrement

Since livestock excrement is already being used at a level close to the physical recovery limit of approximately 90%, it is promoting resource recycling through the use of compost and other materials. It is also promoting advanced energy use through methane fermentation, carbonization

and incineration, according to the conditions in each region, and aim to use approximately 90% of livestock excrement by 2030.

② Sewage sludge

In light of the obligation to make efforts to recycle generated sludge as fuel and fertilizer under the Sewerage Act (Act No. 79 of 1958), it is pursuing the goal of approximately 85% of sludge generated by 2030.

In addition, in light of growing expectations for the effective use of energy, farmland, and biomass from sewage sludge, the Sewerage Biomass Recycling Ratio has been added as a new indicator that indicates the percentage of organic matter in sludge used for energy and green farmland. By promoting businesses' operating efficiency, economic efficiency, and use of advanced energy such as biogas depending on local situations, it aims to use approximately 50% of organic matter by 2030.

③ Black liquor

Almost 100% of the black liquor produced at paper mills in pulp production is used mainly for direct combustion, and it is promoted for use.

④ Paper

Approximately 80% of paper has already been collected and recycled. By continuing to promote the use of recycled paper and promoting the sophistication of energy recovery through fuel conversion adapted for local conditions, it aims to achieve approximately 85% of recycled paper by 2030.

⑤ Food waste

Approximately 58% of food waste (food waste and waste with value) is used, including feed and fertilizer, as well as recycling for energy use and heat recovery. The key is to increase the utilization rate of waste at home and in downstream food distribution, where sorting is difficult. It is promoting recycle waste as feed and fertilizer adapting to local situations. It achieved 63% of the waste by 2030 by promoting the use of advanced energy that is hard to recycle, such as biogas.

⑥ Lumber residue from sawmills

Approximately 98% of the waste from sawmills is recycled for wood boards, paper-making materials, and energy use, which is considered to be almost the limit of recovery at present. It is promoting the use of waste materials from sawmills.

⑦ Construction generated timber

It has set a basic policy for wood chips derived from construction, based on the Construction Material Recycling Act (Act No. 104 of 2000) and the goals on recycling and reduction rates in the Construction Recycling Promotion Plan 2020, and have implemented measures to meet them.

Approximately 96% of the total is used as materials for various purposes such as paper, board, livestock bedding, and energy. It is promoting its use and aim to achieve utilization of approximately 96% by 2030.

⑧ Inedible produce parts

Approximately 31% of inedible produce parts such as rice straw and rice husks are used as feed fertilizer, bedding, and fuel. Including plowing for better capability of farm land, approximately 92% is utilized. The aim is to increase the amount of energy used by conventional fuel, and to achieve approximately 45% (92% including plowing) by 2030, while monitoring the progress of technologies for energy use and material use.

⑨ Forest residue

Approximately 29% of forest residue is used as fuel for generating power as a result of more widespread use for fuel. In order to further increase the utilization rate, the aim is create new uses by promoting the use of energy—including heat and combined heat and power—and development of technologies to efficiently convert biomass into high-value-added substances. At the same time, the aim is to build a stable and efficient timber supply system by 2030.

(2) Formulation of a biomass utilization promotion plan

The Basic Act on Promotion of Biomass Utilization 2009 Law No. 52. Hereinafter referred to as the "Basic Law") It is stipulated that prefectures and municipalities must make efforts to formulate "Prefectural Biomass Utilization Promotion Plan" or "Municipal Biomass Utilization Promotion Plan" in consideration of this Basic Plan.

Based on this, in order to promote voluntary efforts to utilize biomass utilizing the ingenuity of each region, the "Prefectural Biomass Utilization Promotion Plan" is set to be formulated by all prefectures in 2030 (2030).

With regard to the Municipal Biomass Utilization Promotion Plan, based on the fact that similar measures exist, it encourages the switch from the "Biomass Town Plan" to the "Municipal Biomass Utilization Promotion Plan", and on the condition that the "Municipal Biomass Utilization Promotion Plan" has been formulated at the time of the application for the "Biomass Industry City Plan." It promotes the formulation after integrating measures.

Furthermore, since it is important for municipalities, including urban areas, to work on the utilization of biomass in a planned and proactive manner, the goal is that all municipalities own the plans formulated by municipalities that describe the utilization of biomass. Promote their use.

In order to promote the use of biomass, it is important to build a regional distributed utilization system that efficiently uses biomass as products and energy in the region. Therefore, the prefectures and municipalities that have formulated the "Biomass Utilization Promotion Plan" verify the progress of the plan and review it as necessary in accordance with the revision of the Basic Plan. According to the actual conditions of the region and the characteristics of each type of biomass, prefectures and municipalities decide on the use of feed, compost, and energy.

Efforts shall be made to calculate the self-sufficiency rate (local production for local consumption rate), which indicates the proportion of biomass supplied by the region. For example, in the case of energy use, it is desirable to calculate the self-sufficiency rate (local production for local consumption rate) by calculating the ratio of electricity generated by biomass power generation derived from the municipality among the total electricity demand of the municipality.

(3) Scale of the biomass industry

Fostering environmentally friendly industries that utilize biomass existing in rural areas and urban areas for products and energy contributes to economic growth, creation of employment opportunities, and reduction of greenhouse gas emissions in Japan.

Industries that utilize biomass include biomass plastics, cellulose nanofibers, modified lignin, fertilizers that utilize domestic resources. Sustainable Aviation Fuel (SAF) and new energy sources based on local production for local consumption. Taking into consideration the stage from demonstration of related technologies to practical application, the goal is to form a market of approximately 2% of the industrial scale of the products and energy fields by 2030 (2030) and increasing it by approximately 10% in the future.

Section 3. Measures that the government take in a comprehensive and systematic manner to promote the use of biomass

Based on the second goal of promoting the use of biomass, the government takes the following measures comprehensively to achieve it effectively.

With regard to the necessity and urgency of policy support under the Basic Plan and related laws, It is mobilized all policies, including regulations, budgets, taxation systems, and financial measures, while minimizing the burden on the public. It is building a policy system that ensures maximum effectiveness and overall optimization.

1. Development of the infrastructure necessary for the utilization of biomass

(1) Strengthening sustainable initiatives that ensure economic efficiency

In order to promote the commercialization of local biomass, it is necessary to establish an integrated system that ensures economic efficiency, from raw material production to collection and transportation, to production and use, through the Biomass Industrial City.

In order to utilize the biomass that exists in rural areas, it is important to establish a mechanism for sustainable and stable procurement that responds to structural changes in demand through cooperation among local governments, businesses, and financial institutions. Promote the establishment of an efficient and integrated production, distribution, and processing system (supply chain) on an appropriate scale that enables advanced utilization of unused biomass such as forest residue.

In addition, by-products such as residual heat from biomass power generation and bio-liquid fertilizer generated in the process of biogas production is utilized effectively as heating and fertilizer for agricultural facilities, and new agricultural production activities that secure economic efficiency is developed.

(2) Promote efforts to return profits to local communities

In order to promote a recycling-oriented society, it is important to support various efforts according to the actual situation of the region and promote the development of environmentally friendly and disaster-resistant towns and villages centered on the biomass industry.

To this end, it is supporting the creation of initiatives that lead to a virtuous cycle of the local economy, such as promoting the use of biomass-derived products and energy, and the establishment of community-based companies.

In addition, it is increasing profitability by supporting advanced utilization of products with higher economic value, and facility development that thoroughly uses limited resources in multiple stages. It established a sustainable and self-sustaining model for local biomass-based businesses. Promote efforts to return the profits obtained to the local community.

(3) Dissemination of information to promote the use of biomass

In order to promote the maximum utilization of biomass, it is actively promoting the

collection and development of data such as biomass abundance and utilization rates, greenhouse gas reduction amount, and potential of resource crops, and the dissemination of related information. It is contributing to the voluntary efforts of each and every citizen to utilize biomass.

In addition, with regard to advanced initiatives for the comprehensive utilization of biomass, it is showing sustainable business models and promoting the horizontal deployment of these initiatives by widely sharing know-how on successful examples.

2. Creation of businesses supplying biomass or biomass products, etc.

(1) Efforts to activate rural areas and increase Income

To ensure the sustainable use of biomass, it is improving the productivity and sustainability of the food, agriculture, forestry and fisheries industries, which are the supply bases of biomass. At the same time, it is cultivating resource crops on farmland, supplying important regional resource, and work to prevent the occurrence of devastated farmland.

In order to maximize the use of biomass and other regional resources derived from rural areas, it is revitalized local industries centered on agriculture, forestry, and fisheries, promote the development of a sixth-generation industry that utilizes these resources, and promote measures to increase related income in rural areas.

In addition, it is promoting efforts to recycle resources, such as the use of feed for rice straw, compost such as livestock excrement, and pellets for resource crops through cooperation with livestock farming.

(2) Promote advanced utilization of biomass according to the characteristics of biomass

① Utilization of livestock excrement

With regard to livestock excrement, given that there is a large offset in compost supplies depending on the region, it is promoting improvement of the quality of compost, converting into pellets, and widely distributing compost while increasing awareness among users and promoting efforts to recycle resources livestock excrement.

In addition, with regard to energy use using biogas, it is also promoting the use of bio-liquid fertilizer, which is a by-product.

② Utilization of sewage sludge

In light of rising expectations for the effective use of biomass from sewage sludge, energy use and green farmland use, it is promoting the use of green farmland such as fertilizer and phosphorus recovery through efforts such as promoting the use of biogas and solid fuel from sewage sludge, and fostering understanding among users in cooperation with relevant ministries and supporting supply-demand matching.

In addition, from the perspective of resource recycling and regional revitalization in the region, sewage treatment plants and waste treatment facilities accept food waste such as food waste and human waste and septic tank sludge in addition to sewage sludge, and promote effective use of biomass generated in the region.

③ Utilization of food waste, etc.

Based on the Act on Promotion of Recycling and other Recycling of Food Resources (2000 Act No. 116), it is promoting the reduction of food waste and recycling of it as feed, fertilizer, and energy while fostering the understanding of agriculture, forestry, and fishery operators and consumers.

In addition, it is promoting the collection and effective use of biomass at sewage treatment plants using disposers and other tools as part of the effective utilization policy of biomass adapting to local situations while paying attention to the relationship with the Act.

④ Utilization of wood biomass

In order to sustainably use the forest resources of Japan, which has entered the full-scale use phase, it is introducing integrative logging and forestry work to carry out reforestation after main cutting, centralize operations to supply timber stably at low cost, improve road networks, develop and introduce high-performance forestry machines, Promote the development and dissemination of efficient collection and transportation systems.

In addition, it is strengthen the system to provide information on the supply of timber in the region and to match suppliers with actual customers. It needs to expand the use of wood materials such as boards, while making use of unused timber and using cascades. It is also constructing heat and power generation systems with high energy conversion efficiency in the region. By promoting the comprehensive use of woody biomass, such as improving the performance of biomass boilers using wood chips, pellets, firewood, and other fuels, it needs to expand the use of timber from thinned forests and other domestic timber, and aim to develop the forestry and timber industries into growth industries.

(3) Accelerate efforts to achieve carbon neutrality

In order to achieve carbon neutrality by 2050, it is necessary to promote the use of a system that certifies the amount of greenhouse gas emissions reduction and absorption as credits, and to convert chemical products and energy derived from fossil resources to those derived from biomass.

In particular, since the procurement of raw materials for SAF and other fuels is becoming an issue, related ministries cooperate to promote the supply of domestic biomass to biomass-derived fuels and the collection and securing of various raw materials.

In addition, as a further initiative to curb the increase of carbon dioxide and prevent global warming, the recovery and effective use of carbon dioxide generated by biomass power generation and other activities (CCU: Carbon dioxide Capture and Utilization), and bio-charcoal derived from rice husks, pruned branches, and bamboo is applied to farmland to promote carbon storage efforts.

3. Research and development and dissemination of technologies

It is essential to utilize advanced technologies tailored to regional characteristics and lead to innovation through the development of technologies for the utilization of unused biomass, the reuse and recycling of resources, and the promotion of industry-academia-government collaboration

through the formation of bio-communities. For this purpose, related ministries work together to develop technological seeds based on basic and basic research, make use of these technological seeds, and promote advanced research and development through collaboration between industry, academia, and government, as well as the improvement and systemization of existing technologies.

Details of specific initiatives are shown in the fourth section on research and development of technologies related to the utilization of biomass.

4. Develop and secure human resources

In order to develop and secure human resources with specialized knowledge of biomass utilization and other resources that contribute to the promotion of biomass utilization, it is promoting efforts such as enhancement of education, research, and dissemination projects related to biomass utilization, including the operation technology of biogas plants.

In particular, municipalities are expected to play a central role in building consensus among various stakeholders in the region regarding the use of biomass based on the characteristics of the region.

5. Promote the use of biomass products

(1) Expand the use of biomass products

Promote the use of higher value-added biomass products such as raw materials of biomass plastics, cellulose nanofibers, and modified lignin as alternatives to fossil resource-derived products, while promoting the introduction of such products in consideration of harmonization with the resource recycling system.

Promote efforts to recycle resources using livestock excrement and sewage sludge, in particular compost derived from livestock excrement based on the fact that the supply of compost derived from livestock excrement varies widely by region.

(2) Expand the introduction of renewable energy

With the introduction of a Feed in Tariff system for renewable energy in July 2012, the introduction of biomass power generation, which is a stable power source that generates electricity regardless of weather conditions, has been expanding.

In the sixth Strategic Energy Plan, biomass power generation and heat utilization are positioned as regional distributed energy sources and local production for local consumption.

On the other hand, biomass power generation has issues such as the limited amount of biomass resources available for energy use, ensuring sustainability and maintaining high power generation costs. It is promoting the introduction of biomass power generation in harmony with the sound development of agriculture, forestry and fisheries, while expanding the stable supply of biomass fuel and reducing the cost of power generation projects.

About half of energy demand is heat, which accounts for a large part of energy consumption, especially at agricultural production sites in Japan. From the viewpoint of using biomass energy, heat utilization is more efficient than power generation, and it is expected to contribute to cost

savings. Therefore, it is actively promoting the use of biomass as an alternative to fossil fuels.

In addition, it is strengthen efforts for co-generation of heat and power to promote the use of residual heat generated from biomass power generation, which is currently not fully utilized.

However, in order to utilize heat, there are many conditions that must be considered, such as matching supply and demand, difficulty in utilization over wide areas, and sustainability for appropriate fuel procurement. In addition to giving support for establishing facilities, it enhances our guidance and advice system so that solutions to these issues are adequately coordinated in local communities before proceeding with initiatives.

(3) Promoting multi-stage use according to regional characteristics

Biomass varies from region to region, depending on the type, properties, availability, location, demand for products and by-products, distribution patterns, etc. Due to the differences in the conditions of use, materials, heat, and other characteristics of each product, while paying attention to the existing use methods. It is promoting the advanced use of electricity, fuel, and other conversion technologies to produce products with higher economic value.

Biogas generated by methane fermentation of wet biomass such as livestock excrement, sewage sludge, and food waste is currently used for power generation, and promoting efforts to proactively use local autonomous and distributed energy sources such as farming sites and public facilities from the viewpoint of disseminating the use of heat.

The use of biogas as an alternative to city gas is expected to progress through the establishment of a system for purifying, concentrating, and supplying generated biogas.

In addition, it is promoting efforts to expand the supply of biogas-derived hydrogen produced from livestock excrement and sewage sludge to automobile fuels and other fuel.

It is promoting effectively and thoroughly multi-stage use of limited resources, such as collecting and reusing used biomass and utilizing by-products, based on local conditions.

6. Promotion of voluntary activities by private organizations

Provide information and advice on topics such as ESG (Environment Social Governance) investments and loans like J-credits in order to promote voluntary activities to drive the use of biomass by business operators, the public, and private organizations organized by them. In addition, there is effective support for these organizations' activities in view of the importance of these organizations being actively involved in promoting biomass utilization and playing a role as a representatives of local communities.

7. Promotion of activities of local governments

Promote efforts to build a mechanism such as collaboration among relevant departments so that local governments, including both rural and urban areas, utilize effectively and efficiently biomass in regions according to their situations. It is also provide systems and examples of initiatives related to utilization of biomass and other information necessary to ensure that local governments properly formulate and implement measures to promote comprehensive utilization of

biomass taking advantage of regions' characteristics.

Given that municipalities play an important role in the administration of general waste public services, it is promoting efforts to drive the recycling of food waste, paper, sewage sludge, etc. according to each region's situation in addition to seeking cooperation and collaboration between local governments when necessary.

8. Ensuring international collaboration and promoting international cooperation

In order to promote the use of biomass through international harmonization, it is promoting the dissemination of standards related to the sustainable use of biomass energy, international cooperation for promoting research and development related to the use of biomass for the construction of a sustainable society, and technical cooperation for developing regions.

9. Collection of information in domestic and foreign

In order to implement measures that contribute to the establishment and continuation of sustainable domestic biomass utilization initiatives in a comprehensive, integrated, and effective manner, it is collecting, organizing, and using information in domestic and foreign such as best practices, advanced technologies, and the supply and demand situation of biomass from overseas, including imports.

10. Increasing public awareness

It is spreading awareness through activities such as Public Relation and encouraging the spread of information on the significance of using biomass and on technology used for biomass products in order to promote the use of biomass by giving information about and raising interest in the use of biomass among the general public. In doing so, it is cooperating with other environmental activities—such as those forming a recycling-oriented society—in an organized manner and effectively disseminate information. In particular, it needs to spread the information that waste biomass is useable as a resource when treated properly.

Taking this into consideration, it is spread the knowledge that waste biomass has to use not for just incineration or landfills, but also as raw materials for products and as an energy source. At the same time, the use of unused biomass such as forest residue, including thinned timber, leads to appropriate development of forests by expanding the use of domestically produced timber, preventing global warming. It is also disseminating information on how forests contribute to the sustainable development of the multifaceted functions of forests, such as the conservation of land and cultivation of water sources, and deepen the public understanding on all levels.

Section 4. Matters related to research and development of technologies for the utilization of biomass

1. A basic perspective for advancing technology research and development

Biomass is a sustainably renewable resource and has the excellent characteristics of carbon neutrality. On the other hand, it is necessary to develop new technologies and improve existing technologies to overcome these problems in order to use biomass in a stable and efficient manner.

In order to use biomass efficiently and effectively, it needs not only to develop individual technologies, but also to integrate these technologies, from collection, transportation, conversion, and processing. It is important to build a technology system that is established commercially by considering the entire process of utilization as a single system.

In particular, for biomass, which has a low utilization rate, it is an issue that such a technology system has not been established. On the premise of reducing greenhouse gas emissions, ensuring a stable supply, and ensuring economic efficiency, it is necessary to work on solving problems that have become bottlenecks in the construction of technological systems.

Furthermore, while academia (research institutes such as universities) have accumulated knowledge of science, industry is responsible for the social development of technology. It is essential to promote industry-academia-government collaboration.

The use of biomass has immature technological and social aspects, and there are many uncertainties about the future of research and development. Work to solve technical problems in a systematic manner with appropriate division of roles. In order to create a biomass industry through the use of domestic biomass, the government promote a wide variety of biomass utilization technologies through the MeaDRI and Technology Roadmap, while focusing on innovation for commercialization and promotion of the social infrastructure development.

2. Research and development of technologies that promote practical application

(1) Development of sustainable biomass utilization technologies

A wide variety of biomass utilization technologies are being researched, but even if manufacturing technologies are established, they are not price competitive compared to existing products derived from fossil resources, and there are not a few that have not led to practical application. It is important to push up such immature technologies to a highly sustainable one, while keeping an eye on changes in social conditions and demand, and taking into account the business environment, such as manufacturing costs and a stable supply of raw materials.

For this purpose, through collaboration between industry, academia and government, it is improved the sophistication and efficiency of manufacturing technologies and collection, transport, and storage technologies that lead to the spread of biomass products, and work to reduce costs, thereby accelerating Research and development of technologies that lead to practical application and technological verification efforts.

In addition, by promoting commercialization with the participation of domestic plant and engineering manufacturers, the company aims to disseminate and reduce the cost of facilities

such as biogas plants and biomass boilers.

(2) Creation of products with high added value

In order to make further effective use of biomass, it is important to differentiate it from competing products derived from fossil resources and to secure competitiveness in the market.

To this end, it is promoting innovative research and development on high-value-added products and fuel manufacturing technologies, such as the creation of biomass plastics with high heat resistance and impact resistance, and the establishment of methods for manufacturing and using hydrogen gas from sewage sludge.

(3) Establishment of technologies to promote the efficient use of biomass

In order to utilize biomass without waste, it is promoting research and development of efficient conversion and utilization technologies and establish technologies that contribute to the recycling of biomass, such as efficient utilization of surplus heat from power generation and effective utilization of by-products such as bio-liquid fertilizer generated in the process of biogas production.

3. Energy Research and development of technologies that contribute to achieving local production for local consumption

(1) Establishment of an efficient and stable system

Research, development and demonstration is conducted to establish an integrated system such as a self-sustaining and distributed energy system for local production for local consumption using technology to produce liquid fuels such as methanol and hydrogen from biogas derived from livestock waste and sewage sludge, and promote the dissemination of the technology.

In addition, it is promoting the construction of a stable and efficient supply and use system that contributes to the production and transportation of wood biomass fuel that coexists sustainably with forests and forestry, and verification of planting of early-growing trees.

(2) Expand the use of biomass through mixed use, etc.

Regardless of the use of a single raw material, such as promoting methane fermentation by combining livestock excrement, sewage sludge, food waste, etc., and mixing of unused biomass and wood biomass, etc. Promoting mixed use of various types of biomass in accordance with local conditions leads to stable procurement of raw materials and expansion of biomass use.

For this reason, it is grasped the problems that arise from the mixing of multiple types of biomass and raw materials other than biomass, and because it contributes to strengthening resilience such as the treatment of affected crops that occur in the event of a disaster, it is proceeding with research and development of technologies necessary for solving these problems and expanding the spread of them.

In addition, in order to contribute to local production and consumption of energy, risk diversification in the event of a disaster, and improvement of security, it is promoting the

development of technologies necessary for combining energy obtained from local biomass with other renewable energies.

4. Research and development (here after call to Rand D) of technologies to promote decarbonization

Hydroprocessed Esters and Fatty Acids (HEFA) technology, alcohol to Jet (ATJ) technology, gasification and Fischer Tropsch process (FT) synthesis technology that has the potential to use various raw materials for the social implementation of SAF that contributes to decarbonization efforts in the aviation sector, and It is necessary to accelerate the development and demonstration of technologies such as mass cultivation technology for microalgae using carbon recycling technology. In addition, while ensuring a stable supply of existing customers for food and feed raw materials, it is promoting the construction of a supply chain to ensure a stable supply of raw materials for SAF in Japan, such as waste edible oil, waste paper, and wood waste in Japan.

In addition, R&D and demonstration of CCU using gas emitted from facilities in the process of hydrogen fermentation and methane fermentation is promoted.

In addition, it is necessary to promote research on the carbon storage effect by reducing and applying bio-charcoal to farmland, and development of technologies for the formation, restoration, and conservation of seaweed beds and tidal flats to promote blue carbon.

5. Research and development of technologies for building biomass refineries

(1) Development of technologies to efficiently convert biomass into useful substances

In order to build a "biomass refinery" that promotes the replacement of existing products derived from fossil resources with products derived from biomass, it is necessary to advance the development of technologies to decompose and convert biomass into useful and versatile chemical substances, and to develop technologies to resynthesis polymer compounds from these substances according to the application.

For this reason, there are manufacturing high-performance and new materials such as woody biomass such as forest residues and cellulose nanofibers from cellulose in agricultural residues. It is promoting research and development on technologies that utilize this technology, technologies that synthesize chemical products by saccharification of cellulose and hemicellulose, technologies that produce modified lignin from Japanese cedar lignin and convert it into high-performance new materials with high strength and heat resistance, and conversion technologies necessary to promote the introduction and expansion of biomass plastics and other materials.

(2) Development of products in anticipation of future demand

In order to construct a biomass refinery, it is important not only to decompose and convert biomass into useful chemical substances, but also to develop and disseminate specific products using these substances as raw materials.

For this reason, industry, academia, and government work together to develop polymer compounds such as concrete chemical admixtures made from biomass, carbon fibers, and

plastics. It is promoting the development of hybrid materials and other products with a view to future demand, such as hybrid materials by combining them with resins and rubber.

Section 5. Matters necessary to promote measures to promote the utilization of biomass in a comprehensive and systematic manner

1. Appropriate division of roles among various stakeholders and strengthening cooperation and cooperation

In order to make sustainable use of biomass, it is important to build an economical circulation system that organically links the stages of production, collection, conversion and utilization of biomass. For this reason, it is necessary to promote the use of biomass in close cooperation with various stakeholders under appropriate roles.

(1) The role of local governments

Municipalities systematically work on the construction of biomass utilization systems in their communities based on the "Municipal Biomass Utilization Promotion Plan," taking into account the characteristics of each region. In addition, municipalities promote the use of biomass products in facilities and businesses of local governments. Efforts is made to play a central role in promoting the use of biomass in the region through cooperation with local residents and provision of information, such as by creating a system that enables local residents to participate in the use of food waste generated in the region.

While exchanging information closely with municipalities, prefectures make efforts to formulate "Biomass Utilization Promotion Plans" for their prefectures from the standpoint of establishing a biomass utilization system that extends beyond the scope of municipalities and promoting cooperation among municipalities.

In these efforts, it is promoting the formation of social consensus on the use of biomass in cooperation with GoJ.

(2) Roles of people related agriculture, forestry and fishery

The sixth industrialization of rural areas is an important initiative to regenerate rural areas, which not only motivated farmers, forestry workers, and fishery workers but also various business operators in regions to connect resources derived from the rural areas to industries to develop local businesses and create a new businesses.

As a supplier of biomass, it is important for agriculture, forestry and fisheries to simultaneously improve productivity and ensure sustainability of the agriculture, forestry and fisheries industries, which are the foundation of biomass supply. In addition, as individuals that make use of these resources themselves, they are expected to play a major role in building a recycling-oriented society while making effective use of local resources. When supplying biomass, efforts is made to appropriately respond to the needs of manufacturers of biomass products in terms of supply timing, quantity, quality, etc.

However, efforts made to supply biomass with by-products and non-standard agricultural products that are inappropriate for use as food, feed, and materials due to quality, supply and demand, etc. Consideration is given to ensuring a stable supply of food, feed, materials, etc.

(3) Roles of manufacturers and distributors of biomass products

Manufacturers of biomass products, etc. endeavor to install efficient biomass conversion facilities and introduce manufacturing methods that contribute to reduction of manufacturing costs, while taking into account the entire life cycle of the resource cycle, and shall endeavor to make effective use of by-products associated with the production of biomass products as fertilizers and other goods. In addition, distribution businesses strive for efficient distribution and provide information on biomass products to consumers.

(4) the role of financial institutions

In light of the need for cooperation with various companies in the region, financial institutions grasp and understand regional resources, share the vision of the region as a long-term goal, and promote ESG investments and loans with a view toward creating a sustainable recycling-oriented society.

(5) the role of the nonprofit organization

The activities of non-profit organizations are playing a major role in fostering social momentum for each and every citizen to voluntarily and proactively engage in the use of biomass. For example, in cooperation with nonprofit organizations and farmers throughout all area in Japan, rapeseed oil is squeezed from the seeds of canola flowers and provided to school lunches, restaurants, and ordinary households. Efforts are being made to collect waste edible oil and use it as biodiesel fuel.

Nonprofit organizations are expected to conduct autonomous activities that contribute to the utilization of biomass while taking into account the direction indicated in the Basic Law and this Basic Plan.

(6) the role of the people

In order to promote the use of biomass, it is important to deepen the understanding and interest of the people as a whole.

(7) the role of academia (research institutions such as universities)

Basic and fundamental research and development and human resource development at universities are extremely important from the viewpoint of game change through technological innovation, creation of seeds that contribute to solving bottlenecks in industry, and continuous production of advanced human resources in the biomass industry. It is also very important to cooperate with local industries to solve regional issues and become the core of regional revitalization, and to cooperate with local communities.

2. Check the progress of measures and review plans

In the event that new knowledge such as biomass availability and utilization rates are obtained,

an expert meeting is held to discuss the progress of the Basic Plan and changes in social conditions.

In addition, with regard to the goals set forth in the Basic Plan, a survey needs to be conducted on the status of achievement of the goals in a timely manner, and the results need to be made public through the use of the Internet or other means.

In addition, the Basic Plan is reviewed at least every five years, taking into account changes in the biomass-related situation and based on the results of the verification of the status of achievement of the goals, and revised when deemed necessary.