

The distribution and carbon cycle of wood materials in the Japanese Alps region

Hideki Takamura^{1*}, Yoshiharu Asano¹

¹Faculty of Engineering, Shinshu University and Institute of Mountain Science, Shinshu University

The stock of wood in the privately owned forests in Gifu and Nagano prefecture has been increasing year by year. We have to utilize them. If enough trees grow, there will be more carbon storage, but it loses the function of carbon absorption. If we log the wood that is utilizable for the construction of houses and plant trees, we can ensure a sustainable asset for future generations. The amount of the domestic lumber used in the construction of houses is less than the amount of imported lumber used in the construction of houses. It is important to increase the supply of domestic timber in order to use more domestic timber in the construction of houses. The forest area of Gifu prefecture is the 5th biggest in Japan and the forest area of Nagano prefecture is 3rd biggest in Japan. However, the shipments of the lumber at lumber mills of both prefectures are lower in Japan. The reason is the size of the lumber mills in both prefectures is small. To resolve this problem, Gifu prefecture started a new project from 2011. This project aims to supply more "A level lumber" (i.e. the lumber is not crooked and its diameter is more than 14cm). The outline of this project is as follows. The lumber mills ship out the wood after sawing (not drying) to the factory (artificial dry center) where they season and shape the wood. The wood is dried at the artificial dry center. After the drying, the wood is shaped at the artificial dry center and is shipped out. In this paper, we researched and calculated the percentage of wood that was wasted in the forest, the lumber mill and the artificial dry center. We measured the energy used at these three locations. We also calculated CO₂ emissions from energy consumption at these three locations, and during the transportation of the wood. The target tree species were the Japanese cedar which grows in Gifu prefecture and the Japanese cypress which grows in Gifu prefecture. The distribution route of the Japanese cedar which is used for beams in houses is transported from the forest to lumber mill Y, and then from lumber mill Y to the artificial dry center. The distribution route of the Japanese cedar which is used for boards in houses and the Japanese cypress are transported from the forest to lumber mill Y. The Japanese cedar which is used for beams in houses is dried at the artificial dry center. The Japanese cedar which is used for boards and the Japanese cypress are dried at lumber mill Y. We calculated the difference between the amount of fixed carbon and the carbon emissions in order to calculate the carbon balance. We compared the CO₂ emissions of producing the local wood of 1m³ in Gifu prefecture and the CO₂ emissions of producing the local wood of 1m³ in Nagano prefecture. The value of the CO₂ emissions of producing the local wood of 1m³ in Nagano prefecture has already been done in previous research. We compared the carbon balance of the local wood of 1m³ in Gifu prefecture and the local wood of 1m³ in Nagano prefecture. Next, we researched the amount of cubic content of distributing the log and lumber per year at the lumber mill in Gifu prefecture by interviewing the workers. The following results were obtained. The CO₂ emissions at the lumber mill, the artificial dry center and the transporting of the Japanese cedar made from the new project in Gifu prefecture was less than the Japanese cedar made in Nagano Prefecture. The yield of the Japanese cypress which grows in Gifu prefecture from the forest was lower than the Japanese cypress which grows in Nagano prefecture. There was a difference between the amount of fixed carbon in the local wood in Gifu prefecture and Nagano prefecture. The electrical consumption used for distributing the volume of timber at every lumber mill was also different. The volume of the log from the forest to the lumber mill was 18%. The volume of the wood after sawing (not drying) from the lumber mill to the artificial dry center was only 5%.

Keywords: life cycle assessment, carbon balance, local wood, wooden houses, Japan Alps region