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WOOD WASTE POTENTIAL AS FORESTRY COMPETITIVE ADVANTAGE (BY THE EXAMPLE OF THE ARCTIC INLAND TERRITORIES OF THE RUSSIAN EUROPEAN NORTH)

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The research subject is to give consideration of up-to-date best practices of wood waste commercial use, aimed at enhancing forestry competitiveness in the Arctic zone. The research aim is to provide an insight into the potential of wood waste obtained from various logging modes on the territory of the Russian European North and possibilities of its use for commercially successful production. Results of the analysis of business activities of the Russian European North logging enterprises has identified that between 16 and 22 % of wood waste of the total harvested volume are left on cutting area. Between 1.6 to 2.2 mln m^3 of wood waste and firewood suitable for further use are left annually on cutting areas in Arkhangelsk Region only. According to estimations, the potential of wood waste obtained from thinning in protected forests in the Arctic zone mainland of the Russian European North is about 1 mln m^3 annually for coniferous species only. The calculation of resources based on the total available forest fund, as well as harvesting forest fund was done. One of the main reasons of wood waste recycling inhibition on the Arctic territory is insufficient and unevenly developed transport network. Floating factories at the estuaries of the Arctic rivers could possibly mitigate this disadvantage. Tschudi Shipping Company from Norway has made a conceptual design of a forest FPSO (Floating Production Storage and Offloading) that can process waste wood into high value sugar (wood molasses) and high-energy wood pellets. Estimation of commercial appeal of wood waste recycling has been analyzed through the example of the Arkhangelsk Region. The benchmarking study of competitive advantages of up-to-date Norwegian and Russian experiences of wood waste exploitation has been conducted. The Norwegian Research Council has funded the project through their NORRUS program.

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Key words: forestry, wood waste, competitive advantages, Arctic territories, logistics, Russian and Norwegian practices of wood waste use.

Introduction

The issues of waste management are solved in view of the global problems of sustainment natural resource management and competitiveness improvement [1, 4, 9, 12, 19]. The best Russian and foreign practices reveal possibilities of organization of effective activities to involve waste into production (waste to value) in terms of commercial appeal [6, 7]. Rising amount of private companies regard it acceptable to deal with waste exploitation providing high-demand products and increase of marketability of their business. In our country, one of the issues in view of forest complex and forestry is one of wood waste utilization. Requirements to the issue resolving have been established by the strategy aim of increase of forestry marketability on the federal level [17].

In the connection with acceptance of documents on the Russian Arctic zone development, the wood waste recycling becomes challenging as a part of social-economic development of the territory, ecological safety maintaining and competitive ability of the region and forestry [18]. The specified mainland territories of Russian Arctic zone are marked by a considerable number of protected forests. Commercial exploitation of these forest resources is prohibited and timber harvesting is conducted in terms of forest culture care, on the one hand. On the other hand, a considerable economic base of traditional forest exploitation, processing and forest products export are centered on the territory. The aim of the research is to present the potential of wood waste from different cutting types in the Arctic zone mainland on the European Russian North and the possibilities of its use in marketable products manufacturing.

Research objects and methods

The research objects are forest resources of the European North specified by the Edict of the President of Russian Federation of 2 May 2014 “On the land of the Arctic zone of Russian Federation” [2]. These are Murmansk Region, the territories of Mezen`skoe, Onezhskoye, Primorskoye municipal rayons in Arkhangelsk Region, Belomorskoye, Kemskoye, Lokhskoye municipal rayons in the Republic of Karelia, and Nenets Autonomous Okrug. Eighteen forest districts have been established on these territories.

The estimation of coniferous wood waste potential (pine, spruce) has been conducted in the Arctic zone mainland in the European Russian North, the road sufficiency in the forest districts and subjects of the Russian Federation has been analyzed, and possibilities of effective logistics development for wood waste delivery to consumers has been estimated.

Wood waste are regarded as resources for further use and forming competitive advantages. The Russian and Norwegian experience of wood waste recycling in different spheres has been studied [3]. The wood waste in the present study is considered as remains of raw materials, materials and semi-products which are obtained in the process of logging and cannot be used for production of the main products in the same workflow (brunch wood, wood remains from bucking and crosscutting). Wood waste is used in pulp and paper production, production of

wood-based panels, production of composts in forestry and agriculture, and in fuel and power purposes [5–8].

When calculating the volumes of wood waste, waste generation norms of 0.12 for pine and 0.16 for spruce have been used [5, 8]. The coefficients have been applied to the cutting forest area in middle age, ripening, mature and over mature forests. The proportion of pine and spruce has been counted in terms of mature and over mature species stock in view of forest districts. Also, the estimation of wood waste generation has been conducted in terms of data on revealed forest area that allows forecasting potential reserve of wood waste in case of development and increase of wood harvesting. The cutting area has been estimated in terms of liquid forest resources with all cutting types for coniferous species (pine, spruce) on Arctic territories. The information base has been formed in terms of regulations of forest districts and territory forest plans [11, 13, 15, 16].

The cartographic approach has been used for estimation of the logistic schemes; presence of railroads, ways to marine terminals, haul roads sufficiency (of all-year and seasonal access) of the forest districts have been analyzed.

Results and discussion

Lands covered with forests occupy 69.2 % of the Murmansk Region. The total square of forest resources of the Murmansk Region is 9.5 million ha including forest covered area of 5.1 million ha. The total standing timber volume is 226. mln m^3. The total mean timber increment in the forest lands is 2.45 mln m^3. Murmansk Region is characterized by low exploitation stock of timber in mature forests. Estimated annual cutting area is used not more than in 24 %. Lack of transport availability for small consumers and high prime cost of forest production appear to be the main reason of its lack of competitiveness. Extensive reclaiming of Murmansk Region territories in recent past has affected normal life of the ecosystems. The most of the Murmansk Region forest area belongs to the category of protecting forests (64.8 %) where business activities are prohibited.

The total area of the Republic of Karelia is 4.2 mln ha, forest lands occupy 2.2 mln ha, protecting forests are located on the territory of 1.4 mln ha (64.7 %) [1]. Major tenants of forest parcels for timber harvesting are OJSC “Segezha Pulp and Paper Mill”, LLC “TPK Yurma”, LLC “Vega”, LLC “Pitkyaranta-les”. Parcels of forest land are also leased for construction, reconstruction and exploitation of infrastructural facilities, development of mineral deposits, recreational activities and other types of forest exploitation authorized by forest legislation.

The Arctic zone forest territories of the Arkhangelsk Region are involved in dynamic business activities; timber harvesting and processing are implemented by the Titan Group and JSC “Arkhangelsk pulp and paper mill”. At that, major part of the territory belongs to protected forest areas. Forest area of the regarded territory is 7.4 mln ha only, protecting forests occupy 4.7 mln ha or 63.4 % [15].

The total forest area in the Nenets Autonomous Okrug is 3.2 million ha, only 0.2 million ha belongs to the Nenets forest district. There are no commercial forests in the district. The main part of the Okrug forests (3.0 mln ha) are located on agricultural lands used as deer pasture and assigned to deer farms. The territory of the Okrug is located in the zones of tundra (77 %), forest-tundra (15 %), and the sub-zone of pre-tundra taiga on the South-West (8 %). Forest cover of the

Okrug is estimated as 18 % but is highly varied through the territory. Forest cover on the South-West, where the Nenets forest district is located, comes up to 40 % but goes down to 1-2 % on the Barents Sea shores, on the Kanin Peninsula and in the Bolshezemelskaya tundra. The northern forest border to the East of the Pechora river spreads almost along the boundaries of the Nenets Autonomous Okrug. The interests of geological prospecting and oil and gas organizations are focused in the zone where broken forest tape spreads. The forest plan of the Nenets Autonomous Okrug considers the requirements of conservation of pre-tundra forest ecosystems, conditions of native traditional management of natural resources, forest law extension on the forests of the Okrug used for northern deer farming, development of mineral deposits, mineral geological research and other types of forest exploitation [11].

Estimated cutting area and wood waste potential of coniferous species within the identified and cutting fund in the Arkhangelsk region in view of forest districts are presented in the Table 1.

Table 1

Estimated cutting area (annual allowable volume of timber removal) of coniferous species (pine, spruce) in middle-age, ripening, mature, over-mature forests while thinning in the Arkhangelsk region

Forest district	Cutting area, th m^3	Wood waste*, th m^3
Arkhangelskoye		
identified fund	621,6	97,5
cutting fund	145,2	22,8
Onezhskoye		
identified fund	3996,0	585,0
cutting fund	1229,1	179,9
Severodvinskoye		
identified fund	821,6	98,6
cutting fund	233,7	28,0
Mezenskoye		
identified fund	237,5	31,1
cutting fund	2,3	0,3
Total		
identified fund	5676,7	812,2
cutting fund	1610,3	231,0

*the calculation was made according to the standards of waste generation for pine – 0.12 and for spruce – 0.16.

Total volume of coniferous species in the Murmansk region is estimated as 191.63 mln m^3 (pine – 108.59 mln m^3, spruce – 83.04 mln m^3). Using the same methodological approach, the potential volume of wood waste can be estimated as 36.3 mln m^3.

Wood waste volume in terms of the cutting area of liquid forest fund with all cutting types in forest districts of the Arkhangelsk Region and the Republic of Karelia are presented in Table 2.

Table 2

Calculation of wood waste of coniferous species (pine, spruce) in terms of the cutting area of liquid forest fund with all cutting types in forest districts of the Arkhangelsk region and the Republic of Karelia

Forest district	Cutting area, th m^3	Wood waste, th m^3
Arkhangelskoye	160,2	24,6
Onezhskoye	849,0	124,2
Severodvinskoye	390,3	46,8
Mezenskoye	107,2	14,0
Belomorskoye	358,1	47,5
Kemskoye	180,8	24,4
Loukhskoye	704,9	98,1
Total	2750,5	379,6

Generally, the volume of wood waste calculated on cutting forest fund in terms of the concerned territory is presented in the Table 3.

Table 3

Calculation of potential coniferous species (pine, spruce) wood waste on the Arctic zone mainland of the European Russian North

Territory	Cutting fund, th m3	Volume of wood waste, th m^3
Murmansk Region	935,8	120,6
Republic of Karelia — Belomorskiy, Loukhskiy, Kemskiy municipal rayons	154,6	20,8
Arkhangelsk Region – Mezenskiy, Primorskiy, Onezhskiy municipal rayons	1610,3	231,0
Nenets Autonomous Okrug*	–	–
Total	2700,7	372,4

*doesn't participate due to lack of commercial forests and badly developed road infrastructure.

The presentation of data on the potential wood waste calculated in terms of the revealed and cutting forest fund while thinning the forests refers the potential user to the organizations responsible for the forest management activities – forest districts. Calculation of the rate in terms of cutting liquid fund can be considered as forest management activities within long-term lease of forest plots and integration of wood waste recycling business.

The possibilities of wood waste use are regulated by territory features of forest designation as protecting and commercial, geographical zone features and possibility of accessibility by transport. An effective share of logistics in wood waste delivery to consumers is considered determinant in the concerned example [20]. Road density rates in municipalities are described by different degree of attractiveness for special business development. Hard-surface roads length varies from 53 km in the Terskoye forest district to 457 km in the Kandalakshskoye forest district. All-season roads are evaluated from 87 km in the Murmansk forest district to 2250 km in the Kandalakshskoye forest district. The most length of winter roads is in the Pechengskoye forest district – 1243 km. Road density is low and amounts to 0.33 km in the Terskoye forest district, 0.42 km in the Lovozerskoye forest district,

0.75 km – Murmanskoye, 0.78 km – Kolskoye. Road density over 3 km per thousand ha is observed only in the Zasheykovskoye (3.26 km) and Kandalakshskoye (3.03) forest districts [16]. The territory of the Nenets Autonomous Okrug cannot be regarded attractive due to lack of commercial forests and badly developed road infrastructure. The territories of the Arkhangelsk Region and the Republic of Karelia are attractive for wood waste use development due to presence of roads, railroads and ways to seashores.

The transport infrastructure data are presented in the Table 4. It should be mentioned that all the territories have ways to seashores with harbors and port stations.

Table 4

Forest area and transport availability

Territory	Forest area, th ha		Road density, km/1 th ha of total area	Railroad length, km
	Total	Coniferous species		
Murmansk Region (10 forest districts)	9455,4	3732,0	From 0.33 to 3.26 through forest districts	350
Arkhangelsk Region forest districts				
Arkhangelskoye	768,8	230,3	0,7	116
Onezhskoye	1288,8	802,3	1,66	450
Severodvinskoye	454,4	257,1	0,81	150,2
Mezenskoye	1574,6	no data available	0,3	0
Karelia forest districts				
Belomorskoye	653,8	432,0	2,4	106
Kemskiy municipal rayons	326,6	162,5	1,0	117
Loukhskoye	1176,3	724,3	2,6	110
Nenets Autonomous Okrug	3200	no data available	0	0

First of all, the lack of truck haul roads for wood waste procurement on wood lots directly is a deterrent for the development of widespread use of wood waste. Such conditions require combining wood waste procurement with other forest exploitation activities, timber harvesting mainly, and with environmental services delivery [10]. An application of new technologies in timber harvesting and up-to-date waste recycling equipment should be also considered [7, 14].

In Norway the wood waste management is supplied by the government. For example, the Tschudi Shipping Company AS has received government grant to establish wood waste processing on mobile facilities (sea vessels). The available experience of the Tschudi Shipping Company AS encourages considering the possibilities of wood waste recycling development on floating mobile units like barges for the rivers and seagoing vessels for the ocean. Initial findings in the NORUSS project indicate that the optimal barge size is a factory that can handle 50 000 dry tons while the optimal vessel size should be able to handle 100 000 dry tons. The study indicates that available wood waste resources is sufficient to support construction of such a floating unit.

The Norwegian Tschudi Shipping Company AS intend to become a world leader in manufacturing of chemical wood processing products (wood pellets, molasses, wood compost) on ship mobile units [3]. The company studies the possibili-

ties of timber and wood waste use in various fields from biofuel to compost fillers. The offshore vessels can contain units for production of sugar and pellets, pellets only or substrat and sugar. The motivation behind introducing technology for extracting sugars before making pellets of the remaining wood pulp is that the extracted sugars will be sold at a considerably higher price than their value as part of pellets, thereby making the project economics more robust. Most of the ash will be extracted with the sugars. Ash content below 0.1 % is possible. The energy content of pellets also increases when sugars are extracted. Sugar extraction strengthens the project economics, as well as securing a better pellets product. The pellets plant is a non-conventional black pellets plant, consisting of bark furnace and hot water boiler for energy to the dryer, delivered by Opcon, Sweden, belt dryer, delivered by Laxhuber Stela, Germany, pellets unit, with hammer mills, pellets mills and coolers, delivered by CPM Europe, Netherlands. The pellets plant can make black pellets from wood pulp after sugar extraction, and can produce white pellets even if the Pulp & Sugar Plant is not in operation. The processing line for the extraction of sugars is designed according to a method developed by Glommen Skog (patent approved in Russia and USA and pending in EU), and based on research in Norway. The "extra" investment costs for the first Pulp & Sugar Plant is practically covered by a Norwegian state grant, thereby mitigating any investor risk related to it.

Consequently, the Norwegian company has received a competitive advantage which main distinct feature is an effective sea logistics. Application of such floating factories considerably extends the boundaries of economically available wood resources. This is especially relevant in the area of the Arctic zone inland forests which possess significant wood resources and poorly developed road net.

The Norwegian company uses timber hydrolysis technologies which have been lost in Russian economy over the years of reforms. A competitive advantage of the technologies is the variety of products and possibilities of production management according to market conditions. The present-day Russian practice on the researching territories reflects the focus of wood waste processers on the markets of the European Union countries to supply with wood pellets and to provide municipal boiler-houses with wood.

The study of competitive advantages of Russian and Norwegian practices is presented in the Table 5.

Table 5

Competitive advantages of wood waste commercial use

Experience	Competitive advantage
Norwegian	1. Mobility of offshore vessels with wood waste processing, independence from land road infrastructure 2. Leading position in production of floating factories for wood waste processing 3. Extended range of value-added production 4. State support of innovation commercial projects
Russian	1. Presence of significant amount of wood resources 2. Dynamic increase of wood fuel supplies to the European Union countries 3. State support in grants to cover export transport costs 4. Wood fuel distribution guarantees for municipal use

Conclusions

The obtained research results allow considering the potential of coniferous wood waste on the analyzed territories in terms of: cutting forest fund in middle-age, ripening, mature, over-mature forests while thinning the forests; the cutting area of liquid forest fund with all cutting types. A business strategy of wood resources mastering should be chosen according to commercial interest.

The estimation of existing forest resources of the Arctic zone mainland of the European Russian North suggests an attractive potential of wood waste regardless of uneven development of road infrastructure, especially of haul roads. Concurrently the existing transport landscape (sufficient roads, railways and way to the seashore) is rather attractive with the possibilities of building for large-scale mastering of the resources (either as a result of commercial exploitation or in terms of thinning the forests).

The experience of foreign companies and state support are attractive for development of wood waste recycling in case of knowledge and business integration in terms of the territory development, providing forest exploitation efficiency and increase of forestry competitiveness. Floating factories could be a realistic alternative for forest resources use.

REFERENCES

1. Angelstam P., Naumov V., Elbakidze M. Transitioning from Soviet Wood Mining to Sustainable Forest Management by Intensification: are Tree Growth Rates Different in Northwest Russia and Sweden? *Forestry*, 2017, vol. 90, no. 2, pp. 292–303.

2. *Decree of the President of Russia dd. 27.06.2017 No. 287* "*On the Land Territories of the Arctic Zone of the Russian Federation".* Available at: http://www.kremlin.ru (accessed 10.04.2019).

3. Falck H. *Tschudi Shipping Company: Logistics In High North*. INTSOK. Saint Petersburg, 2011.

4. Helmisaari H.S., Hanssen K.H., Jacobson S., Kukkola M., Luiro J., Saarsalmi A., Tamminen P., Tveite B. Logging Residue Removal after Thinning in Nordic Boreal Forests: Long-Term Impact on Tree Growth. *Forest Ecology and Management*, 2011, vol. 261, no. 11, pp. 1919–1927.

5. Korobov V.V., Rushnov N.P. *Processing of the Low-Grade Raw Materials (Problems of Non-Waste Technology).* Moscow, 1991. 288 p.

6. Mikhaylov K.L., Gushchin V.A., Tarakanov A.M. Collection and Processing of Logging Residual and Firewood in a Felling Area. *Lesnoy Zhurnal* [Forestry Journal], 2016, no. 6, pp. 98–109. DOI: 10.17238/issn0536-1036.2016.6.98; URL: http://lesnoizhurnal.ru/upload/iblock/3f1/98109.pdf

7. Mikhajlov G.M., Serov N.A. *The Ways of Improvement of the Secondary Wood Raw Material*. Moscow, Lesnaya promyshlennost' Publ., 1988. 222 p.

8. Mosyagin V.I. *Problems of the Forest Sector Greening*. Saint Petersburg, 1999. 375 p.

9. Nordström E.-M., Nieuwenhuis M., Başkent E.Z., Biber P., Black K., Borges J.G., Bugalho M.N., Corradini G., Corrigan E., Eriksson L.O., Felton A., Forsell N., Hengeveld G., Hoogstra-Klein M., Korosuo A., Lindbladh M., Lodin I., Lundholm A., Marto M., Masiero M., Mozgeris G., Pettenella D., Poschenrieder W., Sedmak R., Tucek J., Zoccatelli D. Shifting from Even-aged Management to Less Intensive Forestry in Varying Proportions of Forest Land in Finland: Impacts on Carbon Storage,

Harvest Removals, and Harvesting Costs. *European Journal of Forest Research*. DOI: 10.1007/s10342-019-01189-z

10. Nunez-Mir G.C., Desprez J.M., Iannone B.V., Clark T.L., Fei S. An Automated Content Analysis of Forestry Research: Are Socioecological Challenges Being Addressed? *Journal of Forestry*, 2017, vol. 115, no. 1.

11. *On the Forest Management Plan of the Nenetskiy Autonomous Okrug. Order by the Governor of the Nenetskiy Autonomous Okrug dd. 20.11.2015 No.* 95-*pg.* Available at: https://www.lawmix.ru/zakonodatelstvo/952343 (accessed 07.05.2019).

12. Pretzsch H., Miren del Río, Biber P., Arcangeli C., Bielak K., Brang P., Dudzinska M., Forrester D. I., Klädtke J., Kohnle U., Ledermann T., Matthews R., Nagel J., Nagel R., Nilsson U., Ningre F., Nord-Larsen T., Wernsdörfer H., Sycheva E. Maintenance of Long-term Experiments for Unique Insights into Forest Growth Dynamics and Trends: Review and Perspectives. *European Journal of Forest Research*, 2019, vol. 138, no. 1, pp. 165–185.

13. *Reglaments of the Forest Districts* (*Republic of Kareliya*). Available at: https://minprirody.karelia.ru/lesnoe-hozjajstvo/reglamenty-lesnichestv (accessed 07.05.2019).

14. Spinelli R., Lombardini C., Marchi E., Aminti G. A Low-investment Technology for the Simplified Processing of Energy Wood from Coppice Forests. *European. Journal of Forest Research*, 2019, vol. 138, no 1, pp. 31–41.

15. *The Forest Districts Reglaments (Arkhangelsk Region).* Available at: http://old.dvinaland.ru.s3.amazonaws.com/dvinaland.ru/power/departments/deples/acts/lesregl.html (accessed 07.05.2019).

16. *The Forest Management Plan of the Murmansk Region.* Available at: https://mpr.gov-murman.ru/documents/lesplan (accessed 07.05.2019).

17. *The Strategy of Advancement of the Forest Complex of the Russian Federation for the Period to Until 2030. Resolution of the Russian Federation Government dd. 20.09.2018 No. 1989.* Available at: http://static.government.ru (accessed 10.04.2019).

18. *The Strategies of the Arctic Zone of the Russian Federation Advancement and Provision of National Security for the Period to Until 2010.* Available at: http://government.ru (accessed 07.05.2019).

19. Victor D., Yueh L. The New Energy Order. *Foreign Affairs*, 2010, vol. 89, no. 1, pp. 61–73.

20. Yakusheva T.V. Integrated Assessment of the Availability of Forest Resources Considering the Development of Forest Transport Infrastructure in the North-West Federal District. *Lesnoy Zhurnal* [Forestry Journal], 2014, no. 5, pp. 113–117. URL: http://lesnoizhurnal.ru/upload/iblock/b1b/3-_-kompleksnaya-otsenka-dostupnosti-lesnykh-resursov.pdf

ПОТЕНЦИАЛ ДРЕВЕСНЫХ ОТХОДОВ КАК КОНКУРЕНТНОЕ ПРЕИМУЩЕСТВО ЛЕСНОГО ХОЗЯЙСТВА (НА ПРИМЕРЕ МАТЕРИКОВОЙ ЧАСТИ АРКТИЧЕСКИХ ТЕРРИТОРИЙ ЕВРОПЕЙСКОГО СЕВЕРА РОССИИ)

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Предметом исследования является рассмотрение современного передового опыта коммерческого использования древесных отходов в Арктической зоне для повышения конкурентоспособности лесного хозяйства. Цель исследования – уточнение потенциала древесных отходов от различных видов рубок на территории Европейского Севера России и возможности использования его для производства востребованных на рынке продуктов. В результате проведенного анализа хозяйственной деятельности лесозаготовительных предприятий на этой территории выявлено, что при заготовке древесины на лесосеке практически не использованными остаются 16…22 % древесных отходов от общего объема заготовленной и вывезенной для реализации древесины. Только в Архангельской области ежегодно на лесосеке остаются от 1,6 до 2,2 млн м^3 лесосечных отходов и дров, пригодных для дальнейшей переработки. По расчетам потенциал древесных отходов от рубок ухода в защитных лесах материковой части Арктической зоны Европейского Севера России только по хвойным породам составляет около 1 млн м^3 ежегодно. Расчет ресурсов проведен на основе данных о имеющемся лесном фонде; вырубаемом фонде в средневозрастных, приспевающих, спелых и перестойных лесных насаждениях при уходе за лесами; расчетной лесосеке по ликвидному лесному фонду при всех видах рубок. Дифференциация расчетов позволяет заинтересовать потенциального лесопользователя в сотрудничестве с лесничествами, ответственными за выполнение лесохозяйственных работ. Полученные данные дают возможность планировать перспективную деятельность по лесопользованию в рамках долгосрочной аренды лесных участков и интеграции с бизнесом по утилизации образующихся древесных отходов. Одной из значимых причин, сдерживающих утилизацию отходов на изученной территории, является недостаточная и неравномерно развитая транспортная сеть. Однако возможности выхода к морскому побережью в регионе делают актуальным применение технологий химической переработки отходов на морских транспортных средствах. Такой опыт рассмотрен на примере норвежской компании «Tschudi Shipping Company AS», внедряющей инновационные технологии переработки древесных отходов для производства продукции и получения прибыли. Расчеты коммерческой привлекательности этой технологии переработки древесных отходов проанализированы на примере Архангельской области. Приведен сравнительный анализ конкурентных преимуществ современного норвежского и российского опыта обращения с древесными отходами.

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