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Conference Paper

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53rd Congress of the European Regional Science Association: "Regional Integration: Europe, the Mediterranean and the World Economy", 27-31 August 2013, Palermo, Italy

Provided in Cooperation with:

European Regional Science Association (ERSA)

Suggested Citation: Zhideleva, Valentina; Bolshakov, Nikolay (2013) : Economical role of boreal forests in the European North of Russia, 53rd Congress of the European Regional Science Association: "Regional Integration: Europe, the Mediterranean and the World Economy", 27-31 August 2013, Palermo, Italy, European Regional Science Association (ERSA), Louvain-la-Neuve

This Version is available at:

<https://hdl.handle.net/10419/123968>

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Economical role of boreal forests in the European North of Russia

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The article is devoted to theoretical and methodological issues of defining the economical role of boreal forests and formation of multifunctional forestry as a factor of sustainable regional development in the forest sector. Based on the objective economical laws and regularities, a brief political-economical analysis of the system interrelation in quality of boreal forests use and social labour productivity in the forest sector is made.

Key words: sustainable development, multifunctionality of forestry, forest management, forest fund, sustainable forest management, forest use, timber harvesting, annual allowable cut, intensive forest management, pristine forests, recreational forest use, boreal forests.

European boreal forests represent a huge forest-marsh system, playing the key role in water-producing area and hydrological regime regulation of many rivers in the European North such as the rivers Kola, Ponoy, Northern Dvina, Onega, Mezen, Pechora, etc. In general northern forests provide a water balance over the territory of 115 mln. ha (that's 38,2% of the total forest covered area in Europe).

The northern boundary of boreal forests in Europe passes from the Urals to the Kola Peninsula along the Arctic Circle and in the north-east of the Scandinavian Peninsula goes up to 67-68⁰ north, sometimes 70⁰ north. The southern boundary of boreal forests passes close to the subzone of middle taiga – 31⁰30' - 62⁰00' north.

Characteristics of the European forest fund and North European boreal forests in the turn of XXI century are represented in Tables 1 and 2.

Table 1

European Forest Fund

Regions and countries	Forest covered area, mln. ha		Wood stock volume, mln. m ³ /%	Population, mln. people/%	Forest covered area per one inhabitant, ha
	Total	Coniferous forests			
Europe					
The continent in total	<u>299.9*</u> 100.0	<u>200.1</u> 100.0	<u>29876</u> 100.0	<u>666.1</u> 100.0	0.44
including:					
The European part of Russia	<u>130.6</u> 43.5	<u>91.1</u> 45.6	<u>12650</u> 42.3	<u>105.2</u> 16.0	1.24
Former republics of the USSR (Ukraine, Belorussia, Estonia, Latvia, Lithuania, Georgia, Moldavia)	<u>24.1</u> 8.0	<u>14.7</u> 7.4	<u>2084</u> 7.0	<u>78.6</u> 12.0	0.31
The western part of Europe (Russia not included)	<u>145.2</u> 48.5	<u>94.3</u> 47.0	<u>15142</u> 50.7	<u>482.3</u> 72.0	0.30

Note:

* In the numerator – absolute indexes, in the denominator – percentage over the continent in total.

Table 2

Brief characteristics of North European boreal forests

Regions and countries	Forest covered area, mln. ha		Wood stock volume, mln. m ³ /%	Volume of commercial mature and overmature forests, mln. m ³	Population, mln. people	Forest covered area per one inhabitant, ha
	Total	Coniferous forests				
Boreal forests in Eastern Europe (Russia)						
Murmansk Oblast	4.354	3.190	200	160	1.1	3.96
The Republic of Karelia	9.267	8.277	919	414	0.8	11.58
Arkhangelsk Oblast	19.851	17.080	2150	1634	1.5	12.41
The Komi republic	28.751	23.000	2837	2190	1.1	26.14
Total:	62.223	51.547	6106	4398	4.6	12.53*
Boreal forests in Western Europe						
Norway	8.9	6.1	621	-	5.0	1.78
Sweden	23.5	19.9	2900	-	9.5	2.47
Finland	20.0	16.0	1773	—	5.1	3.92
Total:	52.4	42.0	5294	-	19.6	2.67
European boreal forests						
In total, western and eastern parts	<u>114.623</u> 38 2**	<u>93.547</u> 46.8	<u>11400</u> 38.3	-	24.2	4.74

Note:

* Forest covered area was calculated per one inhabitant for each region or a country separately.

** In the numerator – absolute indexes, in the denominator – percentage of the total European forest fund.

Represented data testify to the fact that an average forest covered area per one inhabitant in Western Europe is four times less than in the European part of Russia. Today there is an opinion that North European forests survived due to their poor agricultural suitability.

Taking into account severe climatic conditions, low productive capacity of forest soils and their overmoistening, one can conclude that in the foreseeable future most of the territory currently occupied by boreal forests will be also used for forest cultivation. One should take into account that most probably in the nearest future recreational role of boreal forests will rapidly increase, especially in North-East Europe (take as a premise that in Finland, Sweden and Norway tourist business like fishery and hunting has been producing annually quite a good profit over the last 20 years).

All above-mentioned once again proves economical, ecological and social significance of boreal forests in Europe, especially in the central and eastern parts. The belt of boreal forests is creating a powerful outpost zone between the Sub-Arctic and mid - latitude forests. This zone enriches the atmospheric steams passing by with oxygen and biologically active substances, is also the territory of a global carbon stock. It's the place of biospheric energy exchange processes extremely important for Europe, determining the climate for most of the continent.

Boreal forests of Northern Europe have being the source for timber, valuable softwood in most cases. Export of timber processed goods by the end of XX century was 65 bln dollars for all Europe (in the world 140, 5 bln.), whereof 12 bln dollars in Finland and 10, 9 bln dollars in Sweden. Annual timber export within that period was 12,0 mln m³ in Norway, 56,9 mln m³ in Sweden, 52,0 mln m³ in Finland and 120,9 mln m³ in total . The maximum volume of harvested timber was recorded in the second half of 1980^s of the last century in the Russian part of boreal forests.

During that period in the Komi Republic, the Republic of Karelia, Arkhangelsk Oblast harvested timber volume increased by 55.0 mln m³ a year in

total. The harvested timber volume in all three regions is currently about 22 mln m³ (the Komi republic alone had similar volume in 1990).

Komi boreal forests make the basis of the most capacious ecological potential, creating the situation within the region and in the surrounding territories. That's especially typical for boreal forests ecosystem in the northern part of European Russia, which is providing a healthy atmosphere not only in the north of the East European Plain, but over the huge areas of Western Europe. The biospheric function of the regional forest cover is in the carbon-dioxide oxygenic cycle support and is of the prime importance, as provides stability of all climatic conditions on the planet.

The Komi republic is the forestiest region in European North: its forest fund makes 37.9 mln. ha, but its forest covered area is 29.8 mln. ha, total wood stock volume is 2837 mln. m³, including 2190 mln. m³ of mature and overmature stands. The total forest area and wood stock volume in the republic attains one fourth in data for the overall European boreal forests. Annual allowable cut in the state forest fund is 33, 0 mln m³ per year. Such volume of timber harvesting is possible in the Komi forests in principle, but practically is almost unrealistic due to the current state of the forest sector of economy. Main indicators, characterizing forest conditions, timber processing and pulp and paper industries of the Komi republic are presented in pictures 1-6. Most probably in the nearest 8-10 years the increase of harvested timber volume in the Komi republic won't exceed 10 mln m³. However such level of forest use can be reached under the conditions of active state participation in forest management.

The most important problem for the forest sector of the Komi republic is creation of a transport network that makes the basics of rational forest use. Water transportation of timber and goods might also have certain perspectives, as well as railroad transportation in case "Belkomur" project is implemented.

There are 26.14 ha of forest covered area per one inhabitant of the Komi Republic, whereof 80% are coniferous, while in Western Europe – 0.30 ha. In characteristics of the republican climate pattern, it's important to note that a special

phytoclimate is formed in the republic due to a mighty forest cover, it mitigates the temperature behavior to a considerable extent, smoothes the wind flows and atmospheric humidity fluctuations. Few people know that powerful electrical fields that can attain significant sizes especially before storms appear in the forests. Spectral structure of a light flux in forests differs in the amount of blue, purple and ultraviolet rays.

It is common knowledge that any forest environment has some health-improving properties, however Russian citizens and foreign visitors can use them under conditions of well-organized recreational establishment in the Komi republic, roads network in the first place. One should keep in mind that different kinds of winter sports play an important role for the northern regions, but are not possible without a relevant infrastructure. Licensed hunting and fishing can bring considerable revenue to the republican budget. Different kinds of wild animals and birds of the Komi Republic can be of a great interest for hunters: brown bears (6-7 thousand animal units), elks (15 thousand animal units), river otters (it is possible to hunt 200 animal units per year), capercaillies (20-25 thousand animal units per year) and wolves. Licensed fishing of Atlantic salmon, grayling and other valuable commercial kinds of fish is allowed in the rivers. However, there are quite a few sophisticated well-furnished hunting or fishing entities, or recreation entities in the republic.

The forest sector is one of important parts of the world economy, consequently tendencies of development of the Russian timber goods market and services should be considered within the context of global trends. The global tendency is a steady growth of demand on timber, technological and food resources, as well as social and nature protected forest values. In the second half of XX century a demand on social and nature protected forest values was growing notably faster than demand on timber [1].

It follows as a logical consequence that, a developed and increased demand on forest goods and services should be accompanied by development of the whole system of multifunctional forestry and each separate resource as a system element.

Considering peculiarities of forest management, it is significant that a sustainable tendency of forest stands quality improvement might be considered as a main reason of labour productivity growth in the forestry sector.

In regions of the European North of Russia there is a challenging situation with a use of unlimited renewable forest resources efficiency and there are quite few tendencies to change the situation for the better so far.

Therefore, establishment of a reforestation management system is the main trend in sustainable regional forestry development. Forest resources, being natural production tools, can be always used by predominating extensive or intensive type of forest management. Current attempts in intensive forestry can't be combined with the extensive use of forest resources as it would most likely lead to a greater aggravation of antagonism between society and forest. For this reason economical, social, ecological problems solution should be made in the frame of the unified intensive reproduction process.

For historical reasons the situation has been developing so that up to now extensive forest use is predominating, nomadism^x was used as a matrix model, which corresponded to the objective of the public production efficiency increase in a certain period of time, as it afforded to use untouched huge forest resources under conditions of relatively low level of productive forces. In modern conditions there is the need to transfer to intensive forest use, which means to consider forest resources not as a "gift" of nature but the product of public reproduction. Economic demands of the society should act as a shaping power, calling for a new stage of expanded intensive reproduction. Intensive use of forest resources corresponds to their public reproduction, which leads to forest productivity increase, hence satisfaction of needs in forest resources for the national economy and population.

^xNomadism – breeders' life style, transference from settled to moveable cattle breeding

Ideas of transformation (transference) of quality into quantity are described in the article [2], where the authors consider increase of natural resources use efficiency as an important factor for development (the fourth factor).

Notably, challenges in intensification of two elements of forest resources: forest environment and stands productivity should be worked out differently. Whereas forest stand efficiency externalizes itself in tree stands, is harvested and become a common national product, while forest environment is involved in the process differently.

Intensive use of forest environment means keeping the existing and mobilization of new natural forces, acting as a system of natural machines serving the interests of forest environment productivity and conservation of natural relations of forest ecosystems self - regeneration.

Use of natural processes in order to achieve the required results is one of the typical characteristics of national production. Carl Marx wrote on that matter: “It doesn’t matter if the labour is influencing the object continuously with the tools or is giving the impetus by tuning the tools so that they are able to work without any labour efforts due to natural processes to achieve the required effect” [3]. In case of natural reforestation one should consider all human activities as the “impetus”.

Public regulation of forest resources self-reproduction involves them into economy. However, it’s significant to note that forest management and forest use are closely connected and make a unified system, a unified forest capital cycle. This in turn should be regulated. It follows thence that without the regulation of the unified forest capital flow in terms of forest resources reproduction it’s impossible to perform the public regulation of the process and intensification of forest resources use is impossible without intensification of all joint activities in forest management.

So, the main trend of forest production is intensification of forest management in total by means of forest machines and technologies improvement (artificial reforestation), which allows to combine functions of forestry and forest

use in one process , where the elements of value in use and reforestation elements are seamlessly combined.

Involvement of new resources in production instead of the used ones is a peculiarity of forest resources production. Rational forest use is reduced to a thrifty commercialization and a sensible exploitation of forest objects.

A present-day forest use with that type of regeneration used to have and is still having in most cases self-regenerating forests as a resource. In such case forest acts as a “storage place”.

That type of forest regeneration, being efficient at the previous stages of national economy can't provide rational interrelations between forest and society in present conditions. It is limited in conservation and development of all the system of forest resources, including human beings surrounding some forest environment.

As contrasted to the consumer-economic regeneration, the multifunctional [4] regeneration “reconstructs” used forest resources on the basis of organization of various forest functions cycle. Multifunctionality as a regularity of forest-economical system development means joint, complete and non-waste use of all available for a certain level of productive forces forest ecosystem values and its regeneration that gets efficiency of the regional forest sector to the new level due to involvement of natural forces of self-regeneration into economy.

The regional multifunctionality, as we understand, can exist only in one case, when forest resources become the main means of production. Multifunctional forestry has as an objective improvement of tree species composition, increase of its productivity, creation of typical forest stands and landscapes, (artificial reforestation), introduction of progressive technologies and new machines in forestry and industrial production, organization of activities in hunting animals' enrichment and efficient hunting entities management, harvesting and thinning with rational and complete timber processing and non-wastes production, maximum utilization of all forest values.

Transference to the multifunctional type of forest resources regeneration is one of important trends in sustainable development of forest economics, criterion of a mature condition of the postindustrial society.

In this regard a problem of optimization of dynamic sustainable development of the regional forest sector as a basis for sustainable timber supply at timber processing industries to satisfy the growing demands of the society arises. Consequently, insofar as intensification of forest use is concerned, one means control and regulation of forest management and forest use development, which defines the content of forest resources regeneration interrelations. Sustainability of forest management is defined straightly by biodiversity of its functions (genofond).

Direct development, rules and technologies adaptation to continuously changing conditions allow creating the **viable balance** in the forest sector in Komi while using forests in the industrial processes. An ecological-economical system should be understood as an interacting combination of natural and industrial objects, their functioning is caused by a natural-resource factor and they are bound by a unified territory and a common program of development [5].

Multifunctional forest management has a clear and defined aim – maintenance of forest resources in a proper way in order to establish some potential for saving of labour in the future. Saving arises in several concrete directions: forest resources' functions increase, non-used previously forest ecosystems' values are mobilized; costs on forest planning, logging and transportation are reduced; health damage of population is also abridged. The aim of multifunctional forest management is forest ecosystems system conservation and development of its reproductive capacity.

Forest resources efficiency should be considered as a result of a rotation period – number of useful functions that one can get from forest for industrial and private use without breaking the ecological interrelations of self-regeneration.

Nowadays forestry and timber industry can't be opposed. In the presence of certain contradictions they have a social-industrial unity. Both are unified by common objectives in regeneration.

Taking into account lack of acceptable alternative for the forest regeneration which is implemented within the defined rotation period in order to increase forest resources productivity, there is a need to justify rotation of the embodied labour gradually (timber industry production) in order to reach the goal, so forest ecosystems productivity should increase in case of embodied labour efficiency use.

Productivity poses a forest resources potential of the regions, the country in general, that is not a certain readymade amount of values in use. They should be created by the public labour. Productivity being a potential and pre-condition of the public production gets the real economical terms in a certain number of material benefits and services that are produced in a certain period out of resources, forest resources in particular. We mean forest values, connected with the ability to provide population with the direct means of subsistence.

We consider forest resources as forest ecological systems involved in management, they are divided into two parts within the public regeneration process: forest environment and its productivity.

When the objective of forest resources regeneration comes to the fore, a complex of forest resources and each resource in particular gets a real economical value but is not an abstract forest area.

Use of unreformed, integral forest forces gives a bigger economic effect without any additional efforts than modified industrial forests used for timber goods production. Any forest as an ecological system has certain productivity, its skillful use can transfer it into the public labour efficiency.

We lay emphasis on a big role of the unified multifunctional approach to forest resources. Its significance is in the balanced burden on the territorial forest ecological systems, it also allows to use their benefits.

Forest business in the Komi republic in the nearest future won't be competitive because of valuable commercial timber stock exhaustion and will have to deal with non-commercial, less valuable timber that should be also transported by trucks for long distances. One should be ready for that. To overcome that situation in accessible forest areas of the Komi republic, namely in areas with

economically profitable industries there is a need to have not only low quality timber for pulp and paper production but also stands with commercial timber value for wooden houses construction. Commercial timber can be planted on huge agricultural areas once used as agricultural fields, hayfields, and pastures with fertilized soils, which are not used nowadays due to migration of young people to big cities, economically accessible and located close to the infrastructure. In most cases they have changed into secondary forests with low value. Those lands are ideally suitable for artificial reforestation. Forest plantations are stabled as a rule close to big timber processing industrial centers, such as OJSC “Mondi Syktyvkar”. This company, as a responsible forest user, invests not only in new harvesting and timber processing technologies but in reforestation and is better prepared for a new model of timber supply in Russia establishment, as it has one of the biggest in North-West Russia mechanized nursery house with containerized seedlings (total area 5,2 ha).

Development of a complex pre-project and pre-planning programme, reflecting the state policy in recreational issues is the primary target for recreational forest exploitation in the Komi republic. There is a need to provide a tentative inventory of the most valuable objects of the natural and cultural heritage at the republican and federal levels and to work out activities in order to conserve them. A recreational Cadastre of the Komi republic can be the result of these activities.

N.M. Bolshakov in 2000 developed the Complex scheme of the recreational structure development in the Komi republic for the period of 2000 – 2050. In accordance with our calculations, suggested recreational structure of the Komi republic might allow the capacity of 400-500 thousand retreaters a year. Consequently, one can make a conclusion that the recreational potential of the republic is high; it contains the unique natural and historical-cultural elements. A forest cover and a comparatively low anthropogenic impact guarantee the high ecological cleanness of the region, many Russian and European regions can't provide even now. Since the Legislative act dated on 20.12.2012 “About tourism in

the Komi republic” was enacted one can hope on the regional tourism development and that tourism will become one of the prioritized types of economical activities in the Komi republic.

Taking into account the great ecological and economical significance of boreal forests, it’s advisable to make a proposal about international cooperation in the sphere of rational sustainable use and increase of efficiency.

We are of the opinion that it’s helpful to develop an international project proposal “North European boreal forests” with the objective to protect their ecological and environmental role. Hereby a special attention should be payed to boreal forests monitoring, by working out a unified system of forest monitoring in both Western and Eastern Europe, keeping in mind that in North-East Europe, on the territory of the Komi republic, in the Cis-Ural region, vast territories of pristine forests are preserved. Ecological potential of 130 mln ha yet not polluted, almost not damaged or pristine boreal forests ecosystem today make the invaluable capital of Russia, a safe deposit of ecological safety for the region in the long-term perspective.

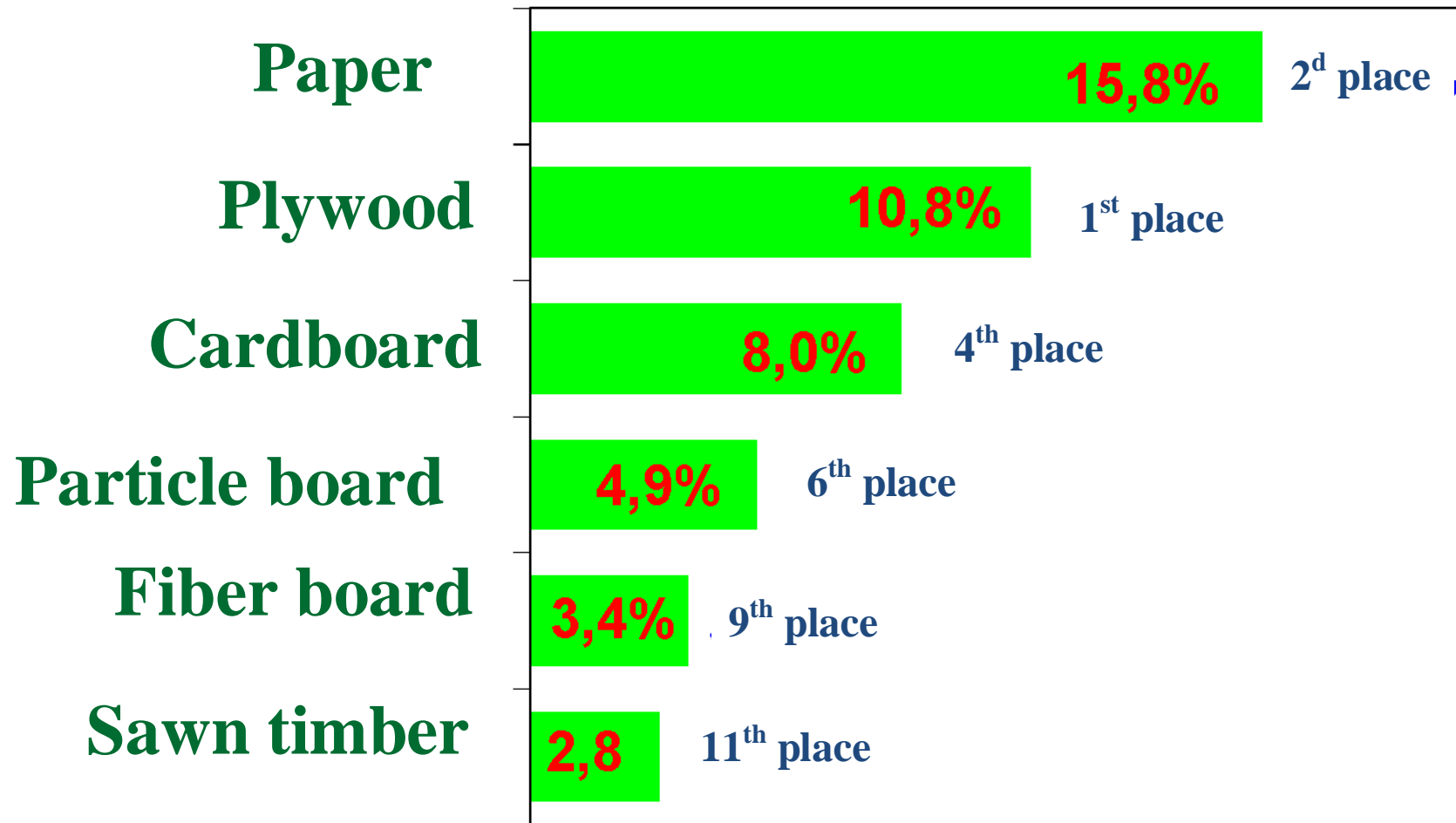
The forest fund of the Komi republic deserves some special attention among the forest regions of the European North, which makes the fourth part of the forest covered area and the wood stock volume of boreal forests and the tenth part of all European forests. Figuratively speaking every tenth tree on the continent is grown on the territory of the Komi republic. Meanwhile it should be taken into account that 1/3 of the republican forests are nature protected areas, mountainous and pre-tundra. Almost 40 mln ha of forest area in the Komi republic are the huge areas for the carbon stock and it actively participates in the biospheric balance.

Hence, the concept of regional development of the forest sector in the European North that should be developed according to the new confirmed state programme “Development of forestry in the Russian Federation by 2020” [6] in order to increase sustainable development and should improve the quality of life of the local population on the territory based on development of timber industry and boreal forests productivity.

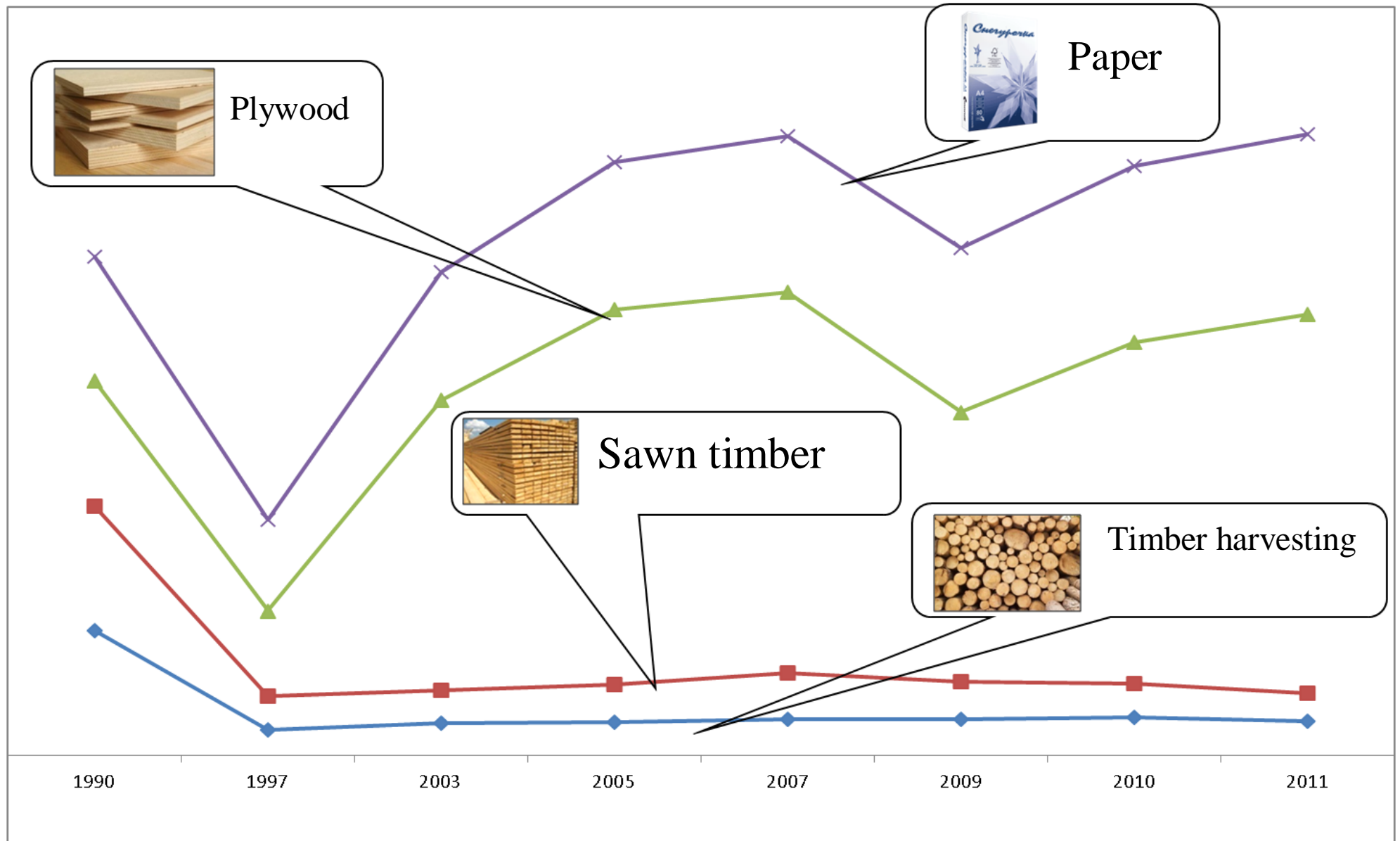
The article is written in the frame of the Russian Humanitarian Science Foundation grant №12-12-11000 a(p) “Management tools of the timber complex in the Finno-Ugric countries and their use in the innovative development of Northern territories”.

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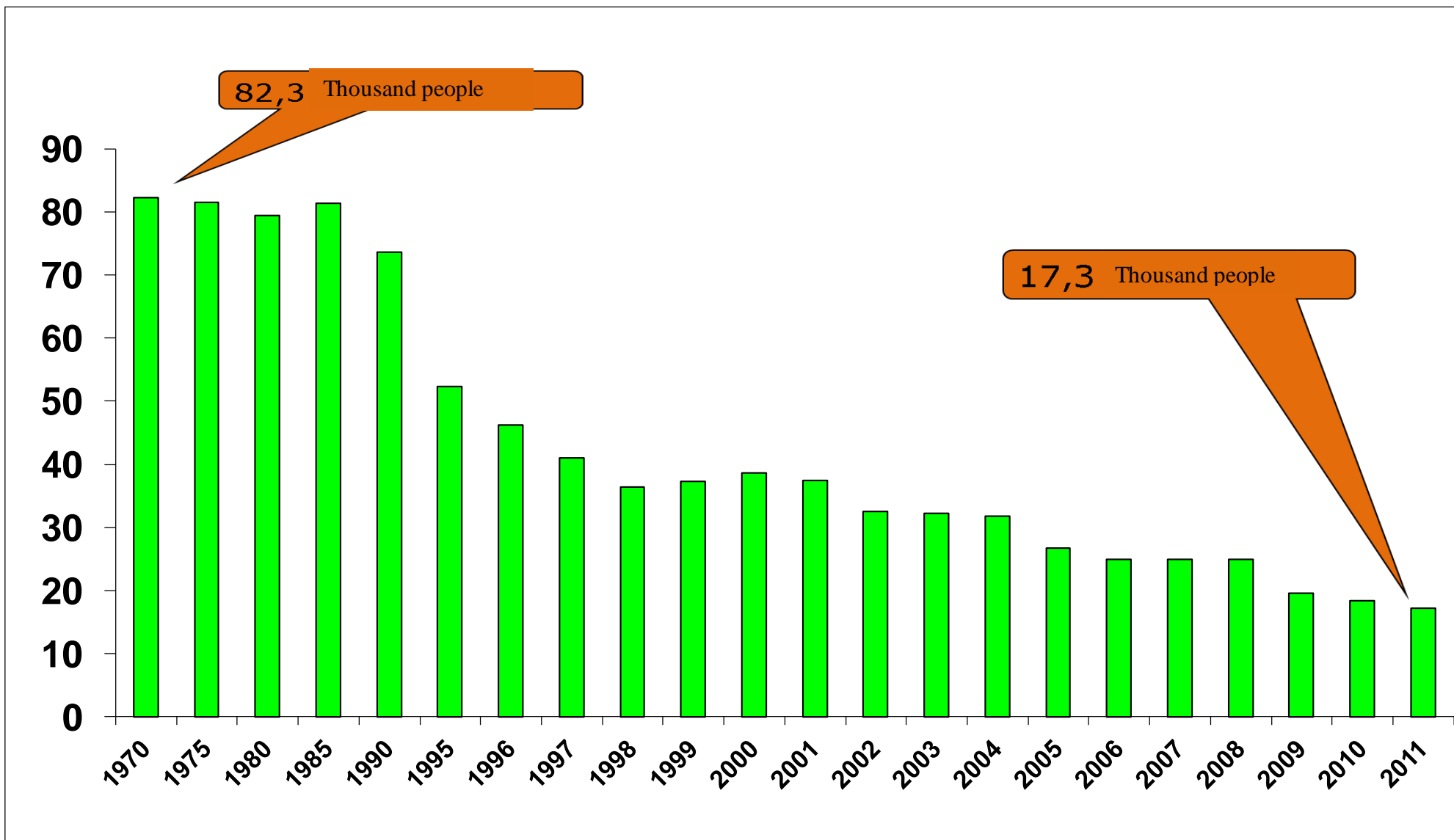
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Picture 1 – the Komi Republic: share of the KR in the RF, %



Picture 2 – Dynamics of production in the Komi Republic timber industry



Picture 3 – Amount of employed in the Komi republic timber industry, thousand people.



The Komi Republic is covered by forests by **87 %**

Harvesting volume is **5,2 mln.m3**

9160 people employed

OJSC Mondi Syktyvkar

Co Ltd. Luzales

Co Ltd. SevLesPil

Co Ltd. Komilesbusiness

Co Ltd. Yasnoglesprom

Co Ltd. Komi forest company

OJSC Burovskoy timber industrial complex



Picture 4 – Logging sector



PLYWOOD 324 thousand m³

Co Ltd. Syktyvkar plywood factory

Co Ltd. Wood boards industrial factory



SAWN TIMBER

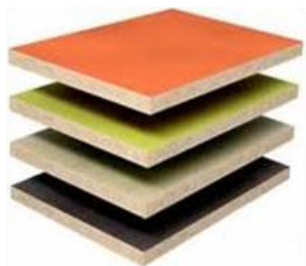
617 thousand m³

Co Ltd. SevLesPil

Co Ltd. Luzales

Co Ltd SLDK Severny les

Co Ltd Nordwood SM



PARTICLE BOARD

321 thousand standard m³

Co Ltd. Syktyvkar plywood factory



WOODEN HOUSES CONSTRUCTION

Co Ltd. Syktyvkar industrial complex



FIBER BOARD 15 mln standard m³

Co Ltd. Wood boards industrial plant

Co Ltd. Particle board factory in Knyazhpogost



WOODEN GRANULES, BRIQUETS

Picture 5 – Wood processing industry

PAPER 737 thousand ton

OJSC Mondi Syktyvkar



Office



Offset



Newsprint

CARDBOARD 233 thousand ton

OJSC Mondi Syktyvkar



SPECIAL PAPER – for sanitary and hygiene purposes.

Sanitary and hygiene products

OJSC Syktyvkar Tissue Group



Number of employed is 4006 people

Picture 6 – Pulp and paper industry