A thesis submitted to the Department of Environmental Sciences and Policy of Central European University in part fulfilment of the Degree of Master of Science

Private sector participation in the waste management scheme of the Krasnoyarsk region, Russian Federation

Alexandra IBRAGIMOVA

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Alexandra IBRAGIMOVA

CENTRAL EUROPEAN UNIVERSITY

ABSTRACT OF THESIS submitted by:

Alexandra IBRAGIMOVA

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This research covers the socio-economic factors and policy gaps of the Russian Federation policy on regional level, with Krasnoyarsk region as a case study. The goal of this research is to contribute to the currently existed waste management system improvement in the Russian Federation. Public-Private Participation (PPP) is considered to be an important tool for implementation of the socially important projects, including those in waste management. It was discovered during the research that there are some significant drawbacks of the currently established waste management system, which could discourage business to participate in the waste minimization scheme through public-private collaboration.

The main factors that could be a reason of low effectiveness of the Russian waste management system are as follow: absence of the comprehensive legislative and intuitional framework for solid waste management recycling; low priority of waste management sphere in finance policy on both national and regional levels; limited use of economic instruments for private sector support; weak controlling and enforcement mechanisms for environmental policy implementation and compliance; lack of environmental awareness amongst the population is also considered to have significant influence on business sector participation; low level of information exchange between all groups of stakeholders and absence of reliable information.

All these factors can discourage private sector to participate in the PPPs project implementation on waste-related issues, planned by the Government of the Krasnoyarsk region. As policy implementation is insured mostly by regional government the main effort should be put on improvement of enforcement mechanisms with simultaneous change of national policy toward the encouragement of more sustainable practices.

Keywords: municipal solid waste management, Russia, private sector, recycling, regional policy

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List of Abbreviations

3R	Reduse-Reuse-Recycle
CEE	Central and Eastern Europe
EEA	European Environmental Agency
EU	European Union
Eurostat	European Statistical Division
Krasnoyarskstat	regional brunch of the Federal State Statistics Division
NGO	non-governmental organizations
OECD	Organisation for Economic Co-operation and Development
PPP	Private-Public Partnership
Rosprirodnadzor	Federal Service for Natural Resources Control
Rostekhnadzor	Federal Service for Ecological, Technological and Nuclear Control
UNDP	United Nations Development Program
UNEP	United Nations Environmental Program
UNSD	United Nations Statistical Division

Chapter 1 – Introduction

This chapter introduces the main subject of the research and problem statement as well as aim, objectives and the structure of the thesis.

1.1 Recycling as a sustainable practice for municipal solid waste treatment

One of the most significant challenges nowadays for every country in the world is unsustainable use of resources which at the end results in a huge amount of waste generated (Christiansen & Fischer 1999). Worldwide waste generation increase is coupled with population and economic growth that influence consumption patterns (Troschinetz & Mihelcic 2009, Žičkienė, Tričys & Kovierienė 2005). Many industrialized countries take active measures to prevent excessive waste generation, but its amount still keeping increase every year (EEA 2011, OECD 2004b). Thus, according to Organisation for Economic Co-operation and Development (OECD) statistics for 2008 almost every country increased its waste generation more than twice since 1980 (OECD 2010).

At the same time disposal on landfills still remains the most common practice all around the world. Landfilling has some adverse environmental impacts such as methane emission, soil and water pollution caused by leachate and landscape changes (Lisk 1991). Additionally, it creates risks from social and economic point of view and basically means material and energy losses (Uiterkamp, Azadi & Ho 2011, Christiansen & Fischer 1999). That is why shifting from landfilling to the more efficient waste management practices is high on political agendas in both developing and developed countries (Uiterkamp, Azadi & Ho 2011). To solve waste management problems it is necessary to insure different stakeholders' participation, especially private sector which plays a crucial role in waste utilization.

1.2 Waste recycling in Russian Federation: national and regional policies

In many developing countries and economies in transition waste recycling issues recently came into focus and there is yet no clear understanding of the advantages of waste minimization measures. Consequently, the huge amount of potentially recyclable waste goes to landfills (Ministry of Natural Resources and Forestry of the Krasnoyarsk region 2010). This situation appears because of policy gaps, inefficient responsibilities' delegation and lack of scientific information relevant for policy implementation.

Russia is an example of the country where poor waste management has been an issue for a long time (OECD 2004b). Despite the great concern, landfilling still remains the main practice in municipal solid waste management (Ministry of Natural Resources and Forestry of the Krasnoyarsk region 2010) and recycling doesn't have strong support from the state. However, the government is currently working on improving of waste management policy on both national and regional levels, such as changing of the Federal Law "On industrial and municipal waste" (Government of the Russian Federation. 1998a) that redefines regional and national responsibilities and The Concept of waste management system improvement in the Krasnoyarsk region.

The waste policy implementation in the Russian Federation is mostly governed by the regional authorities. Therefore, to insure new-planned policy implementation it is necessary to analyze the existing conditions and to identify the main problems of the current waste management system on the local level. The Krasnoyarsk region as one of the most economically stable and industrially developed has a fair chance to create favorable environment for recycling activities from the position of different actors, including private sector.

1.3 Public-Private Partnership (PPP) for Waste Management

Amongst all measures for waste minimization, recycling is considered to be one of the most promising options which could be beneficial from economic prospective under favorable political and social conditions (*OECD* 2008). Although municipal waste is a very complex waste stream (Troschinetz & Mihelcic 2009), which requires complicated treatment, the value of recyclable secondary materials is now well recognized. According to United Nations indicators (UNSD 2011) in a number of developed countries (e.g. Sweden, Germany, Canada and etc.) recycling rate reached the level of 30% out of the whole amount of municipal waste produced and this figure is increasing with the time.

This shift towards sustainable waste management became possible through the joint effort of different stakeholders and not least because of private sector participation. Indeed, business plays a crucial role in recycling activities as governmental authorities can rarely provide with all facilities needed for the whole cycle of waste treatment. At the same time, Kinnaman and Fullterton (2000) shows in their work "The Economics of Residential Solid Waste Managemen" that recycling of municipal waste is driven not only by economic conditions but also by political measures.

The concept of Private-Public Partnership (PPP) is now widely used in many developed countries; however, for Russia it is quite new approach. Considering the stated intention of the Krasnoyarsk region government to improve the existing situation through applying of this concept, it is becoming important to assess all factors that could influence the success of the waste policy implementation. Therefore, the present research undertakes hopes to address the existing policy gaps in waste management as well as other relevant factors on regional level in line with national policy from business prospective on the example of a particular region.

1.4 Research question and objectives

Thus, the main research question is as follow: what are the current conditions created for the business sector dealing with waste issues in the Krasnoyarsk region and what are the possibilities for the private sector participation in the waste management policy implementation.

To achieve this goal, several objectives were established:

1. To describe the current situation in waste management in the Russian Federation and the Krasnoyarsk region from the position of private sector;
2. To determine the role of business in waste recycling in the Krasnoyarsk region;
3. To investigate the existing policy gaps in the waste management sector on regional level in Russia;
4. To analyze the socio-economic conditions that influence private sector development and its ability to participate in waste management schemes in the Krasnoyarsk region.

Chapter 2 – Methodology

The research utilizes a qualitative methods in the form a of case study, with interviewing as one of the main methods used. Both secondary and primary data was used as a source of information.

2.1 Case study approach

As the subject of the thesis is considered to be a component of a bigger structure I have chosen a case study approach. As it was stated by Yin (1993) “the case study is a method of choice when the phenomenon is not readily distinguished from its context”. In the earlier work Yin (1984) stresses that in a case study the boundaries between phenomenon and its environment cannot be clearly understood and that several sources of evidence are used during the research process.

These terms are valid for the present thesis as it studies conditions created by regional measures in line with national policy of the Russian Federation for the waste recycling business sector in Krasnoyarsk area. The clear boundaries between effects from regional and national policies can hardly be distinguished as they both play a significant role in shaping of local conditions. And finally, several techniques were used during this research in order to understand the system as a whole.

According to Marshall and Rossman (1989) there are four different approaches used in case study: exploratory (investigates of new phenomenon), explanatory (explains factors influencing phenomenon), descriptive (documents the phenomenon) and predictive (deals with outcomes of the phenomenon). This thesis aims to investigate what policies are influencing the phenomenon, and how and what are the links between different levels of the case. Therefore it has mostly explanatory and descriptive nature with some potential for exploratory element as the topic is generally undeveloped.

Taking into account all aspects mentioned above, the case study approach has been chosen as the most appropriate for the investigation of policy framework influence on the regional level in Russia.

2.2 Scope of study

The present study covers the Krasnoyarsk region of the Russian Federation (description can be found in Chapter 3). Research was mainly structured around the city of Krasnoyarsk mostly because of geographical reasons and time constraints. An additional reason for selection of this area was that this city is one of the most economically developed amongst others in Siberian Federal area and at the same time has one of worst environmental performances (Ministry of Natural Resources and Forestry of the Krasnoyarsk region 2009). According to the Concept "Waste management system development in the Krasnoyarsk region" (Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a) this area is supposed to be developed in the very first period in 2011-2013 which also shows the importance of the topic. However, I tried to take into account all variety of municipalities where it was possible and look at the region as a whole.

The research is limited to "household municipal solid waste" which includes waste from households, commercial and municipal areas. According to Rostekhnadzor (Federal Service for Ecological, Technological and Nuclear Control) (1998) this category combines "the residues of substances, materials, commodities and products … that partially or completely lost their consumer properties" which refer to fourth and fifth classes according to Russian waste classification (Government of the Russian Federation. 1998a.).

In terms of waste management practices, this research focuses on recycling as one of the most promising options for Russian regions (Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a). Also, the sphere of recycling is partially developed in Krasnoyarsk

which made available to study the existing opinions of business on waste recycling policy. It should be mentioned that in the present research I aimed to investigate recycling business performance and policy measures influencing this sector and therefore interviewed mostly entrepreneurs. However, it is impossible to look only at one stakeholder without taking into account the environment created by other actors. Therefore a number of interviews with different stakeholders were conducted to understand the existing interconnections in this field and its influence on the main studied group.

2.3 Research stages

The research included three main stages: 1) preparatory stage; 2) investigation itself and 3) analysis of findings.

2.3.1 Preparatory stage

This stage included desk research and reviewing of relevant literature (available academic papers and articles, materials from the conferences, national reports and concepts of development) on issues, related to the research topic. This preliminary stage helped to find the gap in the studied field, identify potential subject to analyze and design the research. During this stage the scope of study as well as research aim and objectives were formulated. The preparatory part resulted also in gathering of significant part of secondary information, used on a second (investigation) stage. This includes statistical information, national reports, policies and programs and legislative documents. At this stage, I identified the main groups of interviewees and collected all necessary information which was afterwards used for interview questions. The precise list of potential interviewees was compiled and contacts with them were established.

2.3.2 Investigation stage

The main research question underlay techniques used for the investigation stage. This included a subsequent review of political, institutional and legal frameworks and interviews conducted with business representatives from large and small businesses, municipal and regional authorities and non-governmental organizations (NGOs) representatives involved in waste utilization in the Krasnoyarsk region. During this stage I explored the policy gaps and institutional inconsistency that potentially influence waste recycling business on all levels of waste management in Russia, namely national, regional and municipal ones. Also I investigated the shifts happening now in the studied sphere of waste management (recycling municipal solid waste).

The following techniques were used at this stage:

Analysis of national and regional official documents and independent documents from NGO and business representatives

This includes analysis of publication from governmental authorities such as the Ministry of Environment of the Russian Federation, the Government of Krasnoyarsk area and the Department of Environment and Natural Resources of the Legislative Assembly of Krasnoyarsk area. These documents were gathered during desk research at the preparatory stage and personal communications with officials from these authorities. Additionally I collected materials from a local NGO local entrepreneurs dealing with waste recycling in Krasnoyarsk. These included not only paper documents but also video and audio records from roundtables and meetings in the Government of Krasnoyarsk area.

Analysis of the national and regional legislation

Legislative materials were collected through a specialized juridical database "Konsultant+" (Consultant+) which aggregates the whole number of normative documents and legislative acts of the Russian Federation and its regions as well as experts' comments on, related articles and draft legislation. Additionally, I analyzed information obtained from one of the local municipality (e.g. principles of tariffs calculation for municipal waste transportation companies).

Gathering of statistical information

Some statistical information was gathered through reports of International Organizations such as the United Nations Environmental Program (UNEP), United Nations Development Program (UNDP), OECD, and databases – the United Nations Statistics Division (UNSD), Eurostat.

Statistical information for Russia and the Krasnoyarsk region was gained through electronic databases of Krasnoyarskstat (regional brunch of the Federal State Statistics Division), Postehnadzor, Rosprirodnadzor (Federal Service for Natural Resources Control). However, the most valuable data for Russia and Krasnoyarsk was provided by interviewees from business, NGO and governmental officials through personal communication.

Interviews with business representatives, governmental officials and NGO

Because of lack of information available regarding waste recycling in the Krasnoyarsk area interviewing was one of the main techniques used. Except for secondary data gained through personal communication, it was crucial to know the alternative opinions of entrepreneurs on existing policy which was included in the analysis.

Initially interviewees were selected from NGOs and entrepreneurs database of Krasnoyarsk region. The subsequent subjects of interviews were identified using snowball sampling which, means using each interviewee as a source for new contacts with interview subjects potentially valuable for research. In this case the theoretical sampling approach was utilized with collection of data and its analysis taken place simultaneously. Thus, the analysis provides the further direction for data collection. Data collection stops when the new-gained data doesn't provide new information but rather confirms the existing findings (Punch 1998). In this thesis I aimed only to approach this theoretical saturation because due to the time constraints and data availability issues it could not be fully reached.

In this thesis semi-structured in-depth interviews were conducted, which means using a general interview protocol as a basis for involving interviewees in free discussion. This principle implies new questions popped-up during the conversation that initially could not be included in the protocol due to the lack of experience or knowledge of the researcher. It allows identifying new areas of the field that could be missed when using a rigid set of questions. In this research the several versions of interview protocol were used depending on the interviewee. Thus separate sets of questions were designed for NGOs, representatives of small and large business and governmental officials. The list of interviewees can be found in Appendix 1.

Whenever it was possible, face-to-face interviews were conducted; however a few interviews were done by phone due to unwillingness of interviewees to communicate personally. During personal interviews audio recorder was used upon permission; in case of phone conversation detailed notes were taken and transcribed immediately after the interviews.

2.3.3 Analysis

The term of policy analysis is defined as "a systematic evaluation of the technical and economic feasibility and political acceptability of … policies (or plans, or programmes), strategies for implementation, and the consequences of policy adoption" (Patton and Sawicki 1986).

Primary data (interviews) was analyzed using a standard qualitative approach (Punch 1998) with codes developed (from topics emerged from transcripts analysis) and identifying of specific categories and themes with respect to case study. Afterwards, the topic, that emerged from the interviews were further developed in the analysis section.

Due to number of limitation applied I analyzed mostly policy aspects, such as existing policies, Concepts of development, Infrastructure, Information issues. However, for better understanding of the business environment in the selected region, I included Social and Economic aspects as well.

2.3.4 Limitations of the research

The main limitation of the study is availability of reliable statistical information related to the waste management sector on national, regional and municipal levels. For some indicators (for instance amount of waste collected in the regions) different official sources reported significantly different information. At the present moment there is no measures of amount and composition of waste in the Krasnoyarsk area and statistical indicators are calculated according to population and average quantity of waste per person generated (Sister et al. 2001).

Very few published documents about Russian household solid waste can be found with regard to the topic. Apart from that, most of similar studies were conducted for Europe and the US;

no research has been found for any other country with transitional economy which means that this topic is undeveloped and a lack of theoretical framework. That is why the thesis covers mostly general issues related to studied area rather than specific ones.

Due to limited time it was impossible to take into account all theories and concepts related to municipal waste management system. Also, it was impossible to interview all groups of stakeholders; that is why the study is mostly based on interviews from business representatives and does not take into account households. Limited amount of interviews from the governmental officials and NGOs is explained by the fact that there are few people dealing with waste management issues in the region. Municipality' officials were not included in interviewing due to their unwillingness to participate in the study.

Finally, business representatives often refused to participate in study and share information related to their business. Therefore, interviews were conducted only with those entrepreneurs who were willing to cooperate. However, even in this case the issue of interview biases arises (Punch 1998). That means that there is no guarantee that interviewees shared the best of their knowledge which was also true for representatives from other selected groups. To ensure a valid research approach the triangulation of data sources was used (e.g. using of multiple data sources, interviewing of a variety of stakeholders) (Punch 1998).

Chapter 3 – Theoretical framework

3.1 Concept of Public-Private Partnership

Over the last few decades the new trends in managing of the socially relevant issues emerged with enhancement of the private and public sectors collaboration, or in other worlds Public-Private Partnerships concept development (Saussier & Staropoli 2009). There is no single definition for the PPP term. It can be defined as a "forms of cooperation between public authorities and the world of business which aim to insure the funding, construction, renovation, management or maintenance of an infrastructure or provision of a service" (Commission of the European Communities 2004). Thus, it transfers some part of responsibility for goods or services provision from public sector to private investors (Massoud & El-Fadel 2002).The concept of partnerships itself is not new for the business sector as it usually seeks for win-win solutions (OECD 2004a).

Partnerships between public authorities and private companies are usually established to support socially relevant areas, such as, for example, infrastructure development in a long-term basis. Initially, PPP was introduced to improve transportation sector, but after some period of time it has been gradually changed into the tool used to insure sustainability principles implementation (e.g. in water supply, sanitation and waste treatment sectors) (Kappeler & Nemo 2010).

As it was shown in the Green Paper on PPPs, partnerships between public and private sectors are normally characterized by several features

- Long-term duration of cooperation between public and private partners;
- Funding is usually organized by means of arrangements between different players;
- The importance of economic operators recognized on all stages of the project design and implementation;

- Risks from private partners are transferred to the public sector (COM 2004, Kappeler & Nemo 2010).

The main benefits of private sector participation are: 1) stimulation of implementing of innovative methods (that are normally used by the business) for solving the socially relevant problems; 2) costs reduction through implementing of the most efficient practices; 3) support of environmental protection activities by providing with high qualified labor; 4) giving an access to the private capital (Massoud & El-Fadel 2002).

It should be said, however, that despite all benefits that parties could potentially get through collaborative projects implementation, there are very few successful examples of cooperation between public authorities and business in the EECCA region (OECD 2004a). Thus, private sector is included only in 2% of all projects implemented (OECD 2004a). So this research looks at the factors that might explain the reason for low business participation.

3.2 Policy instruments for waste minimization

Reduce-Reuse-Recycle concept (3R) is a system that was designed to enforce waste generation minimization and includes several components.

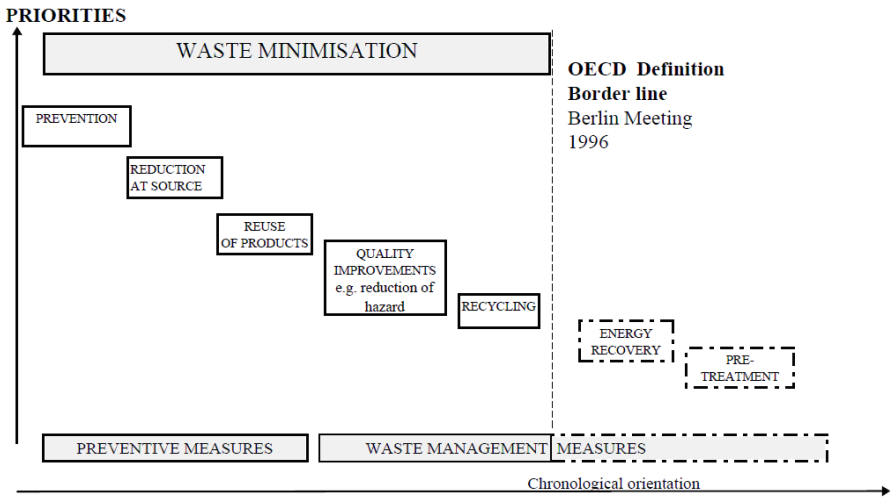

Figure 1. OECD Waste minimization working definition Agreed at the Berlin Workshop

Source: OECD 1998

The concept for waste management that includes all variety of measures in waste treatment was developed by OECD in 1996 (OECD 1998). As it is shown in the Figure 1 recycling is included in waste minimization options, but has lower priority comparing to the waste prevention and reduction.

There are several policy instrument designed in order to support waste minimization activities. The table below gives an overview of these instruments applied for the whole "waste cycle" and different groups of stakeholders.

Table 1. Policy instrument for municipal solid waste scheme

Production Patterns	**Household consumption Patterns**	**Waste generation and Collection**	**Waste Management System**
Economic tools			
▪ Tax on packaging ▪ Economic incentives for cleaner production and waste prevention	Deposit-Refund schemes Taxes on disposable products and packaging	Waste fees and taxes Pays as you throw	Taxes on landfilling and incineration
Regulatory tools			
Environmental Standards Eco-labeling	Eco-labeling	Extended Producer responsibility Regulation on waste collection and recycling schemes Provision of infrastructure for recycling	Framework based on waste hierarchy Environmental regulation on waste management Bans on landfilling Targets for reducing landfilling and incineration of waste Targets to increase recycling rate
Voluntary approaches and Technological Innovation Triple bottom line Eco-design De-materialization	**Social Tools** Environmental education Information on green purchasing Support to voluntary initiatives	**Social Tools** Information on recycling schemes Support to voluntary initiatives	**Technological Innovation** Energy recovery incinerators Cleaner technology

Shift from products to services			

Source: OECD 2002.

According to the OECD paper (2002) a combination of these policies is more effective than using only one policy tool.

3.3 Municipal solid waste generation trends in EECCA

There are very few studies conducted for EECCA that cover municipal solid waste issues. Normally, most part of scientific articles about waste management in this region is dealing with hazardous, industrial and radioactive waste, therefore this section will be based mostly on OECD an EEA reports for this region.

According to OECD report (OECD 2007) population growth and final private consumption were the main probable driving forces for waste generation in the countries with transitional economies in the first period of transition (1992-1999). Another probable driver of waste generation is considered to be GDP growth. As it can be seen from the EEA report (2007) there is clear evidence of the GDP and waste generation interlinking.

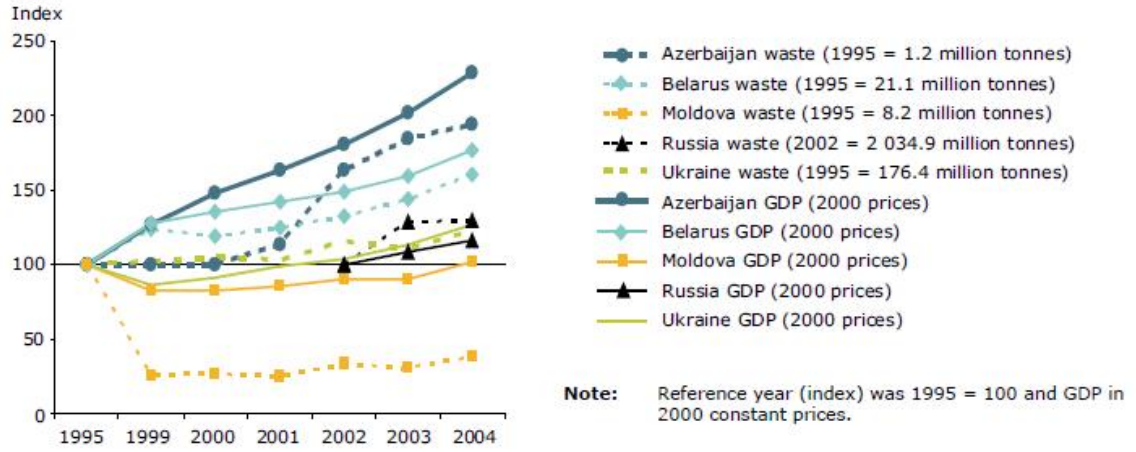

Figure 2. Total waste generation and GDP in the EECCA countries (1995-2004)

Source: EEA 2007.

However, some countries' trends didn't show clear dependence for these two factors (e.g. Moldova). The trends of waste generation can be seen in the Figure 2.

Additionally, there are some specific features that appeared after the Soviet Union breakdown, which were especially visible in the early transition period between 1992 and 1999 (OECD 2007), such as:

- Consumption patterns and food production technologies change, which influenced municipal waste composition (e.g. replacing of glass containers for liquids by a variety of packaging forms) and the weight of cubic meter of the waste;
- Abolishment of a deposit-refund system for packaging (glass bottles);
- Change in the share of money spent on food due to GDP and household income decline (the share increased from 30-40% to 60-75) which increase waste generation per capita;
- Urbanization tendencies with population actively moving from rural areas to the cities, where waste generation per capita is higher than in villages (OECD 2007).

All these factors explain why the level of waste generation didn't decrease significantly after the Soviet Union collapse and prove that in the former USSR countries in the period of 1992-1999 waste generation trends were not dependant on the decrease of GDP and household income (OECD 2007).

3.4 Problems of the municipal solid waste management in countries with transitional economies

According to the Sustainable consumption and Production report (EEA 2007) the situation with waste generation mitigation and waste management in EECCA region still is rather acute. The current inefficiency is taking place in most part of the region is originated from the Soviet Union period, where waste management issues were very low in the political agenda (EEA

2007). Almost all waste stream generated was disposed at landfills without preliminary treatment (EEA 2007). Despite the low quality of data available on EECCA waste sector, it is obvious, that there is no significant progress in mitigation of the municipal waste generation since that time (OECD 2007) and the standards used are almost the same as in the Soviet Union.

At the same time, landfills that were constructed long time ago can not met the nowadays standards on environmental protection (Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a). Almost none of them have methane capturing facilities to reduce adverse impact of waste degradation on climate (EEA 2007).

Another problem is that waste still is not considered as a serious threat for population and therefore legislation enforcement undergoes very slowly (EEA 2007). Undeveloped legislation, lack of incentives and low public awareness results slow down waste management development (EEA 2007, OECD 2007). However, the average amount of waste generated is still much lower that in developed countries (it remains on the level of 250-280 kg per year) (OECD 2007).

3.5. Waste in the Russian Federation

In general, all character features described above for EECCA countries can be applied for the Russian waste management sector. Despite the general public concern, the budget allocated for the waste management issues in Russia shows that it is still quite low in the political agenda (see Figure 3)

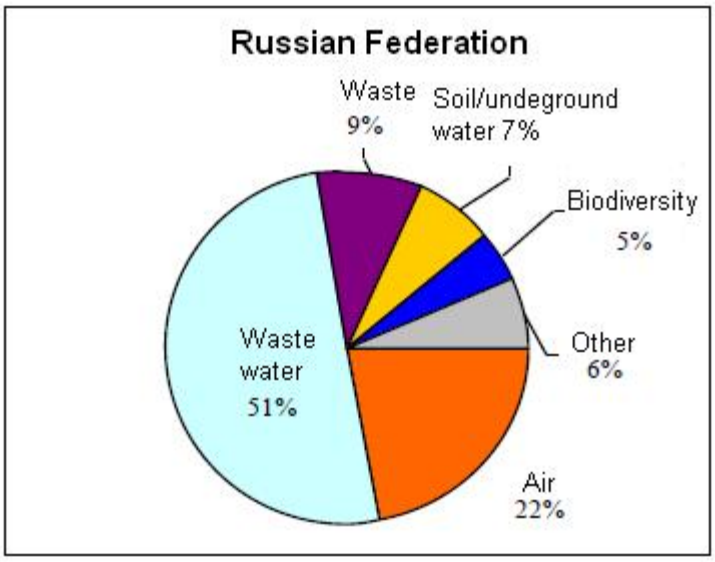

Figure 3. Distribution of budget between different environment protection activities.

Source: OECD 2007

According to the most recent available statistic, Russia has an average level of waste generation of about 250 kg/ year per capita which is almost twice lower that in EU-15 (OECD 2007).

As it is shown in the Table 2 the distribution of waste generation sources is shifted to the industrial waste with municipal solid waste constituted only 1-2 % of the whole amount.

Table 2. Waste generation by source in the Russian Federation (2004)

Type of industry	% of total waste generation
Coal	56
Non-ferrous metallurgy	18
Ferrous metallurgy	16
Chemical industry	5
Power generation	2
Municipal waste	1–2
Construction materials	1
Food	0.61
Other industries including gas and oil producing and processing	< 1

Source: EEA 2007

The annual generation of packaging waste is 50 kg per capita, which is also quite low comparing to the 175 kg of EU-15 (EEA 2007). Packaging recycling rate depends on the fraction (e.g. 5% for plastic waste and 90% - aluminum cans) (EEA 2007).

Waste generation in some Russian cities comparing to the EU countries is shown in the Figure 4.

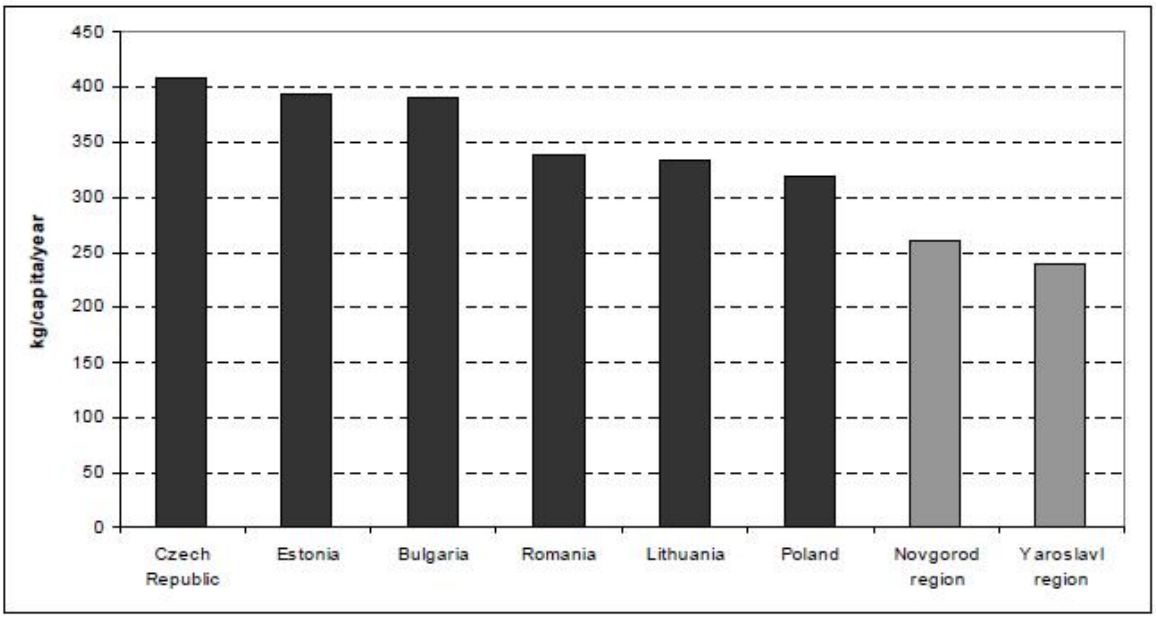

Figure 4. Waste generation trends in two Russian cities compared with selected Central and Eastern Europe (CEE) countries

Source: OECD 2007

Chapter 4 – Case study: waste management in the Krasnoyarsk region

Regions of the Russian Federation differ significantly from each other in terms of geographical and socio-economic conditions, which can influence regional policy strategy. Thus, regional specific should be considered while analyzing waste management system on the example of the particular region. In this chapter a description of the selected case study (the Krasnoyarsk region) can be found. This includes general information, description of the waste management system and waste recycling business for this area.

4.1 Description of the Krasnoyarsk region

Krasnoyarsk region is situated in the Eastern Siberia and constitute a significant part of the Siberian Federal District territory. The total area of the Krasnoyarsk region, including Evenki and Taimyr (Dolgan-Nenets) municipal districts is 2367 thousand kilometers (13.7% of the whole Russian territory) (Ministry of Natural Resources and Forestry of the Krasnoyarsk region. 2008). The distance between extreme northern and southern points is 3000 kilometers, between western and eastern – 950 kilometers (average) (Government of the Russian Federation 2011). The map of the Krasnoyarsk region is shown on the Figure 5.

Krasnoyarsk region consists of 44 municipal districts and includes 15 cities and 4 so-called "closed administrative territorial formations" ("closed cities") (Government of the Krasnoyarsk region 2011a, Government of the Russian Federation 2011). According to the population census conducted in 2010, there are 2828.2 thousand of people living in the region (Federal Service for State Statistics 2010). The average population density is 4 times lower comparing to average for Russian Federation and is 1.3 people per 1 square km.

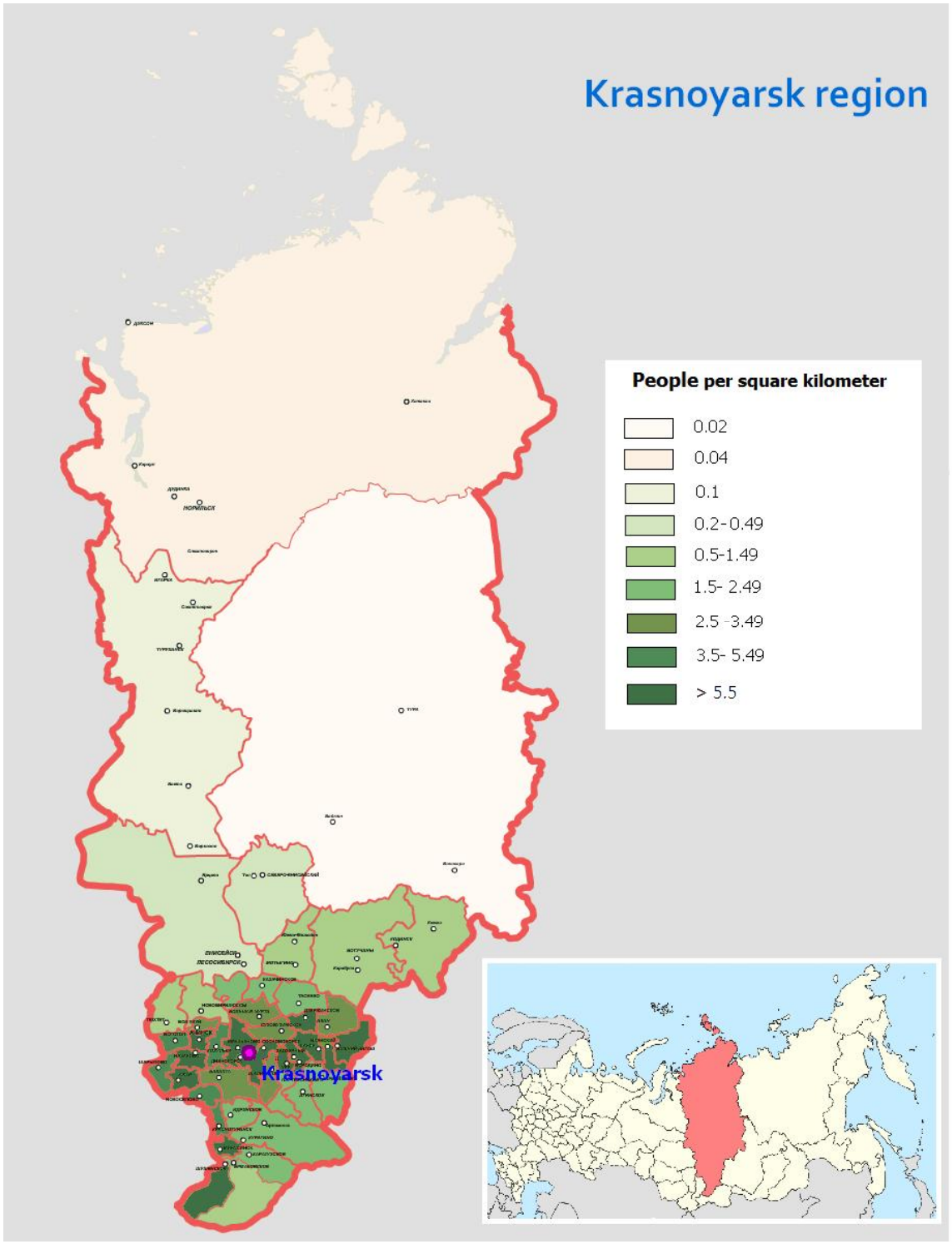

Figure 5. Map of the Krasnoyarsk region

Source: Adapted from the Government of the Krasnoyarsk region 2011b.

The clear trend toward urbanization can be observed with around 76% of population concentrated in the cities (Ministry of Natural Resources and Forestry of the Krasnoyarsk region 2010). Only three cities, including Krasnoyarsk have population of more than 100,000, while all other localities fall into the category of small settlements (Federal Service for State Statistics 2010). Additionally, the most part of population live in the central and southern parts with very few settlements in the north. Northern municipal districts (Evenki, Turukhansk and Taimyr) that cover 85 % of the Krasnoyarsk region territory have average population density of 0.13 people per square kilometer (Government of the Krasnoyarsk region 2011b).

This can be explained by several factors, such as extreme climate conditions and vulnerability of ecosystems that limit the economic development of the region. Thus, a significant inconsistency in economic activities can be observed with most part of industry and infrastructure situated in the southern and central parts of the region (Ministry of Regional Development of the Russian federation [2008]). At the same time northern part of the Krasnoyarsk region has an enormously high resource potential with large deposits of mineral and hydrocarbon resources: oil, natural gas and coal (with estimated potential of more than 53 billion tonnes of oil equivalent) (Government of the Krasnoyarsk region 2011a). Thus, the main industrial activity held in the northern part is resources extraction with subsequent processing of raw materials in the southern and central parts of the region.

The main human and industrial resources are concentrated in several cities: Kansk, Achinsk and Norilsk (the only big city under the polar circle), but especially in Krasnoyarsk. Despite high scientific and educational potential, industry in the Krasnoyarsk city has mostly resource processing specification (Ministry of Regional Development of the Russian federation [2008]) with predominance of heavy industry (ferrous and non-ferrous metal production), machinery, chemical and forestry processing industries (Ministry of Regional Development of the Russian federation [2008]).

4.2 Waste generation in the Krasnoyarsk region

According to the federal legislation, there is an official requirement that oblige individual entrepreneurs and legal entities (including agricultural and transportation organizations) dealing with waste streams to provide statistical information regarding waste generation, transportation and utilization of the regional departments of Rostekhnadzor with according to Federal State Statistical Reporting Form 2-TP (waste) (Federal Service for State Statistics 2011). The information collected is represented in the annual governmental reports "On environmental condition and protection" on both local and national levels.

According to these official source (Ministry of Natural Resources and Forestry of the Krasnoyarsk region 2010) there was 298 million tonnes of waste generated on the territory of the Krasnoyarsk region in 2009. However, since most of the villages don't have access to the landfills waste is usually removed and buried without control from the government (Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a). Therefore there is still a lack of statistical data on waste issues from rural areas of the Krasnoyarsk region. According to the draft Concept of Waste management system improvement for the Krasnoyarsk region till 2020 produced by "Corporation "Krasnoyarsk-2020" for the Government of the Krasnoyarsk region, the estimated amount of waste is just less than 1.2 million tonnes if being calculated through population size and waste generation rate for Krasnoyarsk region.

The main amount of this waste refers to the 5^{th} and 4^{th} classes of hazard as can be seen from the Table 3, which includes municipal solid waste as well.

	I	**II**	**III**	**IV**	**V**
Overall	Extremely	Highly	Moderately	Low-hazard	Practically

	hazardous	hazardous	hazardous		non-hazardous waste
298.2	0.0002	0.001	0.2	2.4	295.6

Table 3. Amount of waste generated by classes in the Krasnoyarsk region in 2009, million tonnes.

Source: Ministry of Natural Resources and Forestry of the Krasnoyarsk region 2010

The total waste generation in the Krasnoyarsk region has been growing since 2001 as shown on the Figure 6 (obtained from Krasstat).

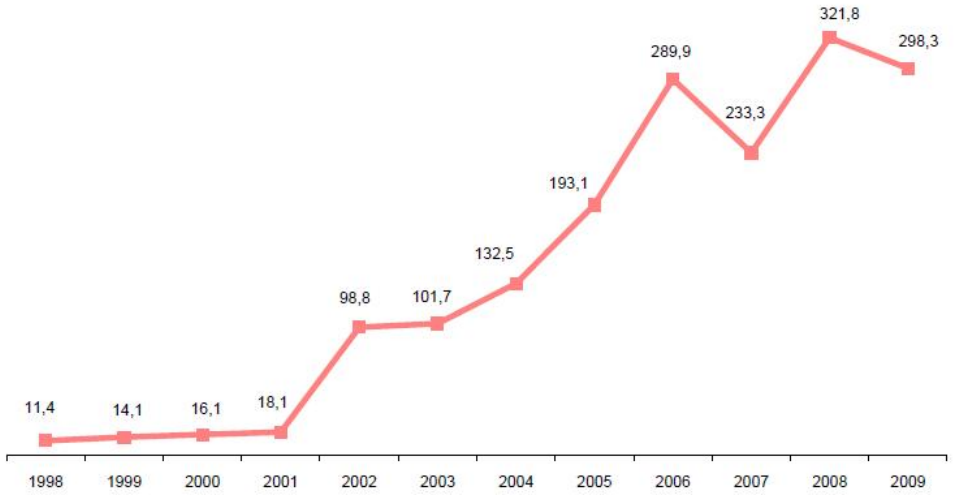

Figure 6. Production and consumption waste generation in the Krasnoyarsk region (million tonnes).

Source: Krasnoyarskstas 2010.

Due to resource extraction and processing orientation of the industry in the study region, the share of households, commercial and municipal areas in waste production was quite small –

they were responsible only for 110 thousand tonnes in the waste stream (Ministry of Natural Resources and Forestry of the Krasnoyarsk region 2010). The main amount of waste originated from mining (overburden layer), and constituted 94.5% (or 281.8 million tonnes) of the whole figure (Ministry of Natural Resources and Forestry of the Krasnoyarsk region. 2010).

In terms of household waste generation in cities of the region the leading position is occupied by Krasnoyarsk. According to the Federal Environmental Report on Environmental Condition of the Ministry of Natural Resources (2010) it is on the fifth place amongst big Russian cities with total amount of waste generated of 112.2 million tonnes (Ministry of Natural Resources and Environment of the Russian Federation 2010). This likely to include not only the Krasnoyarsk city itself but also nearby rural areas, which are served by Krasnoyarsk's municipal services. The table with waste generation rate for big cities is presented below.

Table 4. Waste generation in major cities of the Krasnoyarsk region in 2009 with potentially recyclable fractions.

Municipality	Amount of waste produced, thousand tonnes/year			Potential amount of recyclable waste, thousand tonnes/year
	Total	Cities	Rural Areas	
Krasnoyarsk	325.17	324.75	0.42	97.55 – 227.62
Norilsk (including Talnah)	69.37	69.37	0.00	20.81 – 48.56
Zheleznogorsk	62.26	60.58	1.68	18.68 – 43.58
Achinsk	37.92	37.92	0.00	11.37 – 26.54

Kansk	32.96	32.96	0.00	9.89 – 23.07
Lesosibirsk	23.66	23.61	0.04	7.10 – 16.56
Minusinsk	23.50	23.50	0.00	7.05 – 16.45
Zelenogorsk	23.33	0.00	0.00	7.00 – 16.33

Source: Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a.

4.3 Waste management in the Krasnoyarsk region

According to the Governmental report on Environmental conditions in the Krasnoyarsk region (2009) landfilling still remains the main practice in waste utilization in the Krasnoyarsk region. In 2009 the whole area occupied by landfills and dump sites was estimated to be 6.3 thousands of hectares. These landfills are often far from being environmentally complied (Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a) and cause extensive soil pollution with leachate. Additionally, methane from landfills contributes to the greenhouse effect and creates security threat due to explosions and subsequent fires that significantly affect already unfavorable air conditions in main cities of the region.

According to the Governmental report on environmental protection in the Krasnoyarsk area (2010), there are 948 waste disposal facilities in the Krasnoyarsk region, including 26 landfills and 683 dump site in the rural areas with 3819,935 million tonnes of waste accumulated there (Ministry of Natural Resources and Forestry of the Krasnoyarsk region 2010). The total amount of waste generated is growing in the region, although there are no long-term trends reflected in the official literature. The trends for waste generation and waste utilization for the Krasnoyarsk area during the period of 2006 - 2009 are shown in the **Figure 7** (Ministry of Natural Resources and Environment of the Russian Federation 2010)

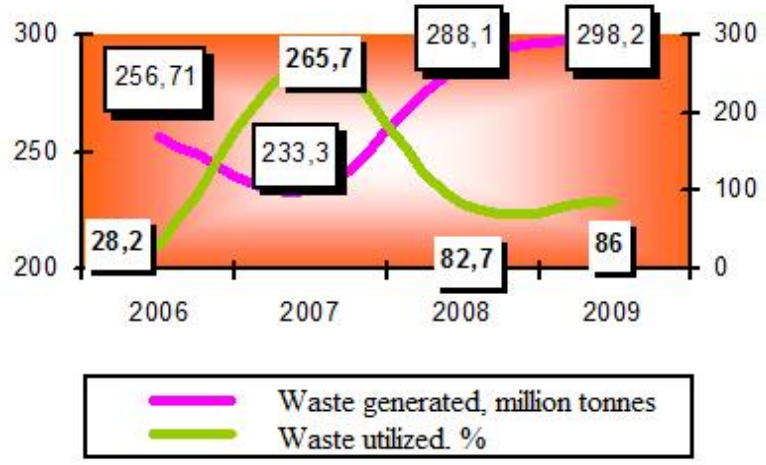

Figure 7. Dynamics of consumption and industrial waste generation and utilization in the Krasnoyarsk region

Source: Ministry of Natural Resources and Environment of the Russian Federation 2010

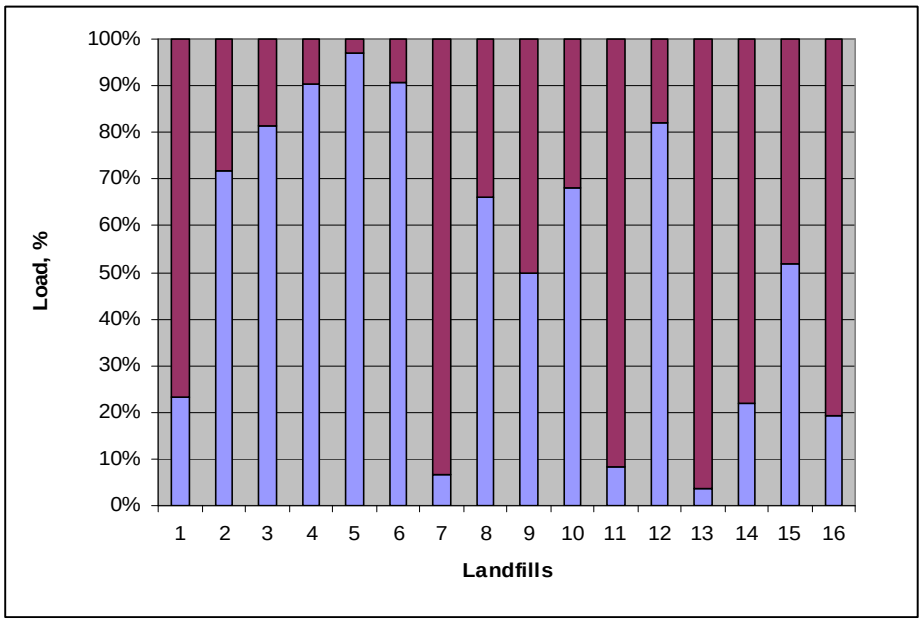

Figure 8. Loading of the ladfills of the Krasnoyarsk region, 2009

Source: Adapted from Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a.

The situation with the level of waste load for landfills is rather heterogeneous as shown in the Figure 8, with 85-90 % of loading for northern regions where industrial and municipal solid

waste is disposed on the same landfills (Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a). The city of Krasnoyarsk has only one functioning landfill "Avtospecbasa" (Rykov pers comm.) that also serves nearby rural areas and therefore the problem there is especially acute.

4.4 Waste recycling in the Krasnoyarsk region

The number of companies dealing with waste issues, which also includes waste recycling business, is about 8000 (Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a). There is no large-scaled municipal solid waste processing plants in the Krasnoyarsk region as well as other industry that may use secondary resources in production cycle. Therefore all waste fractions collected or separated are transported to the other regions (both in the Siberian Federal District and the European part of the country) Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a). As for waste sorting plants, there is one in Krasnoyarsk ("Clean City") with waste recycling potential enough to sort all waste stream from the Krasnoyarsk city. There was another waste sorting facility in Krasnoyarsk, however it has recently bankrupted. The main part of recycling business operating on the territory of the Krasnoyarsk region is small and medium-sized business with collecting points situating within large cities.

There is no separate collection taking place on municipal level, except for one of the municipal companies in Krasnoyarsk that has separate paper and cardboard collection on a regular basis (Ministry of Natural Resources and Forestry of the Krasnoyarsk region 2009). Some amount of waste is collected with the help of regional NGO "Krasnoyarsk regional environmental union" who is dealing mostly with waste from educational institutions.

There is no reliable information on amount of waste resources collected and recycled in the Krasnoyarsk region, some accounting is taking place only in Krasnoyarsk. According to the

Krasnoyarsk Administration (2010) in 2010 the total amount of the secondary resources collected constituted 44477,5 tonnes for the Krasnoyarsk city. The amount of different waste fractions collected in 2010 is shown in the Table 5.

Table 5. Secondary resources collected in the Krasnoyarsk city in 2009

Secondary resources	Amount, tonnes
Paper	12290.3
Plastics	984.4
Glass	29071.0
Tires	214
Used oil	225.445
Accumulators and batteries	836.84
Metal	645
Electronic equipment	50.5

Source: adapted from Krasnoyarsk city Administration,

http://www.admkrsk.ru/citytoday/ecology/Pages/VtorSir.aspx

Chapter 5 – Policy mechanisms in waste management sector

5.1 Legislative framework

Legislative acts that regulate waste management sphere can be divided on several groups (Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a):

1. Codes, Federal Laws and Federal government regulations;
2. Legislative acts of the subjects of the Russian federation;
3. Municipal legislative acts;
4. Sanitation rules and regulations;
5. Construction rules and regulations;
6. Standards and technological specifications and
7. Norms and rules on hazardous waste treatment (Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a).

Federal Law "On industrial and consumption waste" (FL №89)

The Federal Law "On production and consumption waste" was originally established in 22.05.1998 by the Government of the Russian Federation as the main regulatory legislative act in the sphere of waste management. Several changes of this law appeared during the period of time, the current edition was adopted in 30.12.2008. It defines the legal basis of production and consumption waste practices in order to prevent the negative impact of these types of waste on human's health and environment and governs the usage of waste as an additional source of raw materials (Government of the Russian Federation. 1998a).

This legislative act has established a framework for waste management and set comprehensive requirements for all actors. The main controlling mechanism that insures the compliance of environmental standards is establishing of limits of waste one can dispose, normatives of waste generation for different activities and the maximum permissible impact on the environment.

The conceptual framework includes possible activities definition, such as collecting, landfilling, using, transporting and disposing of waste. The term "recycling" itself does not appear in this law; however it is connected with "waste usage" term, which includes utilizing of waste for production processes, provision of services and energy recovery. The "recyclable waste" is also not defined except for ferrous and non-ferrous metals fraction (Government of the Russian Federation. 1998a).

The Law establishes methods of economic and administrative regulations of waste activities (Government of the Russian Federation. 1998a) Thus, economic regulation is implemented through the "polluter pays" principle with different tariffs set for waste disposal under and above stated limits. Another principle includes the need for complex processing of material resources (analogue of waste minimization in international classification) in order to prevent the waste generation and economic incentives in the sphere of waste management.

The above incentives include:

- decreasing an amount of payments for waste disposal if the polluter (both individual entrepreneurs and corporate entities) take actions to prevent waste generation (through technological improvement) and
- applying of accelerated depreciation principle for production assets used in waste management sphere (Government of the Russian Federation. 1998a)

In terms of waste collection, the Federal Law provides an opportunity for separate collection but the order and/or need for this activity are defined only on municipal level (Government of the Russian Federation. 1998a)

The Law describes the whole variety of waste streams management procedures, including hazardous waste disposal and recording of quantitative and qualitative characteristics of waste as well as passportization of such waste. The owner of hazardous waste must insure its safe

disposal. There is some ambiguity in waste management of biological waste as the Law doesn't have rules for managing of this type of waste. There are some secondary legislative acts covering this area. Thus, according to Federal Law № 89 (Government of the Russian Federation. 1998a) about biological wastes some fraction are considered to be hazardous and have to be treated in a special way which never appear in FZ 89.

The given Federal Law prescribes the statistical reporting for the entities dealing with waste including waste generation (for companies and entrepreneurs), using, transporting. Statistical reporting also covers the waste given or obtained to/from other entities/individuals (Government of the Russian Federation. 1998a) The main document according to the Law includes all gathered information is Federal Cadastre of waste, which includes waste classification catalog, inventory for waste disposal facilities, and database for waste streams and technologies for its utilization (Government of the Russian Federation. 1998a). Despite the fact, that these requirements were stated since the very first edition of the Law, the database is still under development and Cadastre is not assessable for general public.

Since the Federal Law "On industrial and consumption waste" contains indirect norms and regulations the secondary legislative acts are implied on both economic and environment aspects.

Federal Law "On environment protection" (FL № 7)

The Federal Law "On environment protection" was designed to insure the sustainability of anthropogenic activities and to save the favorable environment for future generations (Government of the Russian Federation 1999). It determines the legislative and institutional mechanisms of environmental protection, and regulates the interactions between society and natural environment that appear during economic activities (Government of the Russian Federation 1999).

Waste disposal is determined as one of the main activities that cause negative impact on environment and therefore considered as a subject of payment (utilizing the “polluter pays principle”) (Government of the Russian Federation 1999). The Law has special section for waste regulation which establishes environmental protection mechanisms with respect to FL 89. It covers mostly hazardous and radioactive waste management in the aspects of its disposing and transporting and refers to the FL 89 in terms of solid waste management. However, it sets the general principle for the whole variety of waste stream in form of prohibition of waste dumping into water bodies, on the ground or burying of waste without protection (Government of the Russian Federation 1999).

The Law governs soil and groundwater protection from threats that could potentially appear from a variety of pollutant objects, including waste disposal facilities, especially polygons. Interestingly, the only type of waste regulated on Federal level is radioactive waste, while other types of waste seem to be out of federal jurisdiction. However, for municipal level the Law indicates the same responsibilities as it appears in FL № 89.

The Law insures the governmental support of environmentally responsible business representatives, as well as those, who are dealing with environmental protection as their main activity This includes economic regulation measures such as tax incentives and any other financial/administrative support which could be given for companies and individual entrepreneurs who implement best available technologies, use renewable energy sources and use waste as a source of materials (which involves recycling) (Government of the Russian Federation 1999).

Federal Law "On licensing of certain activities"

According to this law and Federal Law № 89 collecting, using, rendering harmless and disposing of I-IV classes of waste are activities that must be licensed (Government of the Russian Federation. 1998a, Government of the Russian Federation 2001). License is not needed when dealing with V class of waste (most part of household waste) (Government of the Russian Federation 2001).

Federal Law "On general principles of local municipal self-government in the Russian Federation"

According to this law, organization of waste collection and disposal lies within municipal settlement responsibility. Municipal districts are responsible for the waste utilization and processing of the production and consumption waste. Main responsibilities lies on this level of governing. Regional government can only identify the direction of the development and insure regulation compliance

Federal legislation on sanitary-epidemiological welfare of population

The main regulatory act in this sphere (Federal Law "On sanitary-epidemiological welfare of population") (Government of the Russian Federation 1998b) says that production and consumption waste must be collected, utilized, neutralized in a way that these procedures don't create a threat for population health and environment (Government of the Russian Federation 1998b). The additional conditions are defined by secondary legislative acts and Sanitary-Epidemiological Norms (SENs). Any activity in waste management area must be conducted according to the sanitary rules and regulations (Government of the Russian

Federation 1998b). The list of SENs related to the municipal solid waste management is listed in Table 6.

Table 6. Sanitary-Epidemiological Norms (SEN)

№	Name of the Sanitary-Epidemiological Norm	Date of issuing
2524-82	Sanitary rules on collecting, storing, transporting andprimary processing of secondary materials	22.01.1982
42-128-4690-88	Sanitary rules of detention of populated areas	05.08.1988
13-7-2/469	Sanitary rules on collection, utilization and neutralizing of biological animal waste	4.12.1995
2.1.7.1038-01	Hygiene requirements for the landfills for municipal solid waste	30.05.2001
2.1.7.1322-03	Hygiene requirements for the disposing and neutralizing of production and consumption waste	15.06.2003 г
2.1.7.2790-10	Sanitary requirements for the medical waste management detention of populated areas	17.02.2011

Draft Law "On changes of Federal Law "On industrial and consumption waste" and other legislative acts of the Russian Federation"

The main purpose of this Law is to redefine the municipal and regional responsibilities in waste utilization. It was submitted to the State Duma (the main legislature authority in Russia) in September 2010 and now it is passing the process of further drafting (State Duma 2010). It being approved it will add some new responsibilities to the existing ones on regional level, such as 1) designing and construction of waste utilization, neutralization and burying facilities; 2) organisation of waste usage, neutralizing and burying of municipal solid waste stream; 3) defining of the procedures of the selective collection of recyclable fractions. At the same time

it removed some of responsibilities regarding waste utilization from the municipal level. As it can be seen, this draft Law includes the principle of the selective collection of waste fractions. It should be mentioned, that waste collection still falls into the category of municipal functions, which means, that selective collection should be organized by municipalities under the guidance of regional authorities.

5.2 Concepts of development

Household waste recycling topic has always been a subject of attention for general public, business and governmental authorities in Russia since the society realized the necessity of solving the waste problem. The government has attempted to implement several developmental programs in order to improve the existing system of waste management and encourage business to invest in this sphere. This section includes Concepts of development of the waste management system both on national and regional level as well as regional programs of business support to show the existing potential for recycling business sector development in the Krasnoyarsk region.

Concept of the Municipal Solid Waste Management in the Russian Federation

This concept was the first attempt of the Government to systematize the sphere of the waste management on federal level. It was introduced in 2000 by the Gosstroy of the Russian Federation – an authority that was responsible for the construction sphere in Russia at that time (later became a part of the Ministry of Regional Development). The concept is addressed to the housing and utilities services managers on regional and municipal levels, who are responsible for the long-term planning. It is still remains the only concept of development on the national level in Russia and it has never been revised since year 2000.

The document indicates the main problems in the waste management sphere that create obstacles for effective mechanisms implementation:

- absence of the unified system of waste management;
- poor responsibility delegation and organizational problems;
- inadequate financial support;
- absence of economic incentives in order to support sustainable practices in business sector and emerge of recycling industries.

The main aim of the document is to support the transition of the housing and utilities services from highly dependent on the state financial support sphere to the self-sufficient system. The main developmental areas therefore are as follow:

- technological renovation of the sanitation service equipment;
- introducing of a two-stage system of waste transportation;
- the secondary use of materials/recycling of the main part of waste stream;
- ecologically safe landfilling of the rest part of the waste stream;
- secondary resources and products market development;
- introducing of efficient of tax, loan and depreciation policy;
- introducing of effective system of state accounting and collecting for waste sphere;
- tariffs policy optimization;
- decreasing of the price of the services for population (Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a).

The Concept sets overoptimistic objectives for waste management sphere, such as 20-25% decrease of waste sending to the landfills through selective waste fraction collection, conducting of total inventory of landfills and illegal dump sides (Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a) that yet have not been implemented. However, it describes the problems clearly especially from the environment protection position.

The importance of recycling was mentioned several times in the document. To promote recycling activity some policy instruments were recommended to be implemented (e.g. legislative changing). The mechanism of economic stimulation is based on polluter-pays principle, which is doubled in the Federal Law "On consumption and production waste" (Government of the Russian Federation. 1998a, Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a). Additionally, it has a set of incentives for legal entities that are implementing new technologies for waste minimization/recycling or participate in waste recycling organizing (Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a). These subjects could gain tax incentives (on profits, value added tax), simplified procedure of governmental long-term loan obtaining, regional transportation subsidies, accelerated depreciation of fixed assets, free access to information related to waste issues and etc. However, it is mentioned that these incentives could be got after the Gosstroy decision, which does not exist any longer.

Draft Concept "Waste management in the Krasnoyarsk region till 2020"

The Concept of waste management system improvement in the Krasnoyarsk region is currently under development. It was written by the public corporation "Korporacia "Krasnoyarsk 2020" (Corporation "Krasnoyarsk 2020") to satisfy the state order from the Government of the Krasnoyarsk region. It was supposed to be released in 2010, but yet there is no full official final version except for clusters description. This fact influenced my results because I made my

assumptions based on draft version available at that time. Despite this limitation, the document is of high importance for this thesis, therefore I used it in my research.

The main aim of the document is to solve the problem of low efficiency of the waste management system in the Krasnoyarsk region through proposing technical solutions, legislative and institutional changes and inclusion of recyclable fraction in the economic activity (Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a). The parts of waste stream that are supposed to be managed by this Concept includes: used tires, used accumulators and batteries, paper and cardboard, mercury-containing waste, wooden, plastic, construction, bulky, biodegradable and medical types of waste. The Concept proposes to divide the whole territory of the region into clusters and insure the homogeneity of recycling activities in each cluster. So far the regional division part is the only officially published document connected with the Concept by the Government of the Krasnoyarsk region. The process of implementing of the concept will include two stages (2011-2013 and 2014-2020) according to Government of the Krasnoyarsk region (2010) with the first period starting from 2011. It is important to mention, that the studied Concept is built on the principles of private-public partnership, which remains quite new and undeveloped sphere for Russia. According to Rykov (pers. comm.) the main investments will be insured by large business (waste sorting plants) existing at the present moment, such as “Stroi+” and “Clean City” (“Chistyi gorod”). The proportion of public/private financing will be 1/5, which means that business is considered to be the core element of the system in terms of financing, while the Government and other executive authorities (e.g. Rostekhnadzor) will insure environmental compliances of landfills and other waste management practices (Rykov, pers. comm). The whole sum planned to be invested in this project is estimated to be more than 11 billion of rubles (or 275 million of Euros) (Rykov, pers. comm.). Thus, business will be responsible for waste accumulation stations building, as well as for trucks (both small and large) purchasing (Rykov, pers. comm).

State will additionally provide financing for garbage containers suitable for large trucks and develop model project of landfills for settlements of different sizes (Rykov, pers. comm).

The general tasks for the whole period of the Concepts implementation include:

1. Development of the legislative basis for municipal solid and production waste utilization;
2. Increasing of population inclusion in the waste management aspects and awareness;
3. Development of the policy conditions favorable for industry development within clusters formations;
4. Development of the comprehensive geographical scheme for waste utilization, recycling and neutralizing of the waste stream;
5. Development of the production waste management system;
6. Introducing the safe practices of medical and biological waste utilization;
7. Rehabilitation of the illegal dump sites;
8. Development of the regional information system for the whole stakeholders engaged in waste management (Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a).

The main activities that will take place according to the plan till 2013 are listed in the Table 7. According to the proposal on cluster's development for the region there are six districts with large or medium cities as a basis for waste processing industries (Ministry of Natural Resources and Forestry of the Krasnoyarsk region. n/a.).

Table 7. Measures planned according to the Concept of the waste management system development

	Measure	**Finance support, millions of rubles 2011-2013**
1	Development of regional regulatory mechanisms and structure for effective solid waste management	-
2	Amending the law "On Environment Protection" to ban burying of waste without preliminary sorting	-
3	Development of exemplary legislative acts for municipalities, including methodology recommendations on waste disposal tariffs calculation	-
4	Development of projects of the standard landfills for settlements (depending on the population size)	9.7
5	Development of the Geographic Information System (GIS) "Waste management in the Krasnoyarsk region"	3
6	Development of a set of measures to encourage industry and business to implement environmental management system (ISO 14000)	5
7	Establishing of the regional Association of the waste recycling business in the Krasnoyarsk area	-

Source: Government of the Krasnoyarsk region 2010

The main purpose of this structuring is in enlargement of the scale of waste recycling, which would make it economically sound and help to mitigate regional specific (large distances between settlements).

The clusters and their recycling centers are as follow:

- Central (Krasnoyarsk)
- Eastern (Kansk)
- Western (Achinsk)
- Southern (Minusinsk)
- Priangarski (Eniseysk)
- Northern (Norilsk, Igarka).

The typical logistic scheme for those clusters that have all year around transportation availability is shown in the Figure 9. Additionally there are specific plans developed for each cluster with particular recommendation on the waste utilization objects construction. For Northern and Priangarski clusters with low transport availability, burying will remains the main method of waste utilization. Additionally, it is planned to build waste incineration plant to ensure energy recovery (Government of the Krasnoyarsk region 2010) for the Northern region. For the other regions it was the maximum distance for waste transporting to the waste recycling plants should be less than 100 kilometers, which is reasonable from the economic point of view. Waste utilization from the villages situated far away from the waste recycling plants will be insured by landfills construction according to the model projects of landfills that will be developed by the Government (Ministry of Natural Resources and Forestry of the Krasnoyarsk region. n/a.).

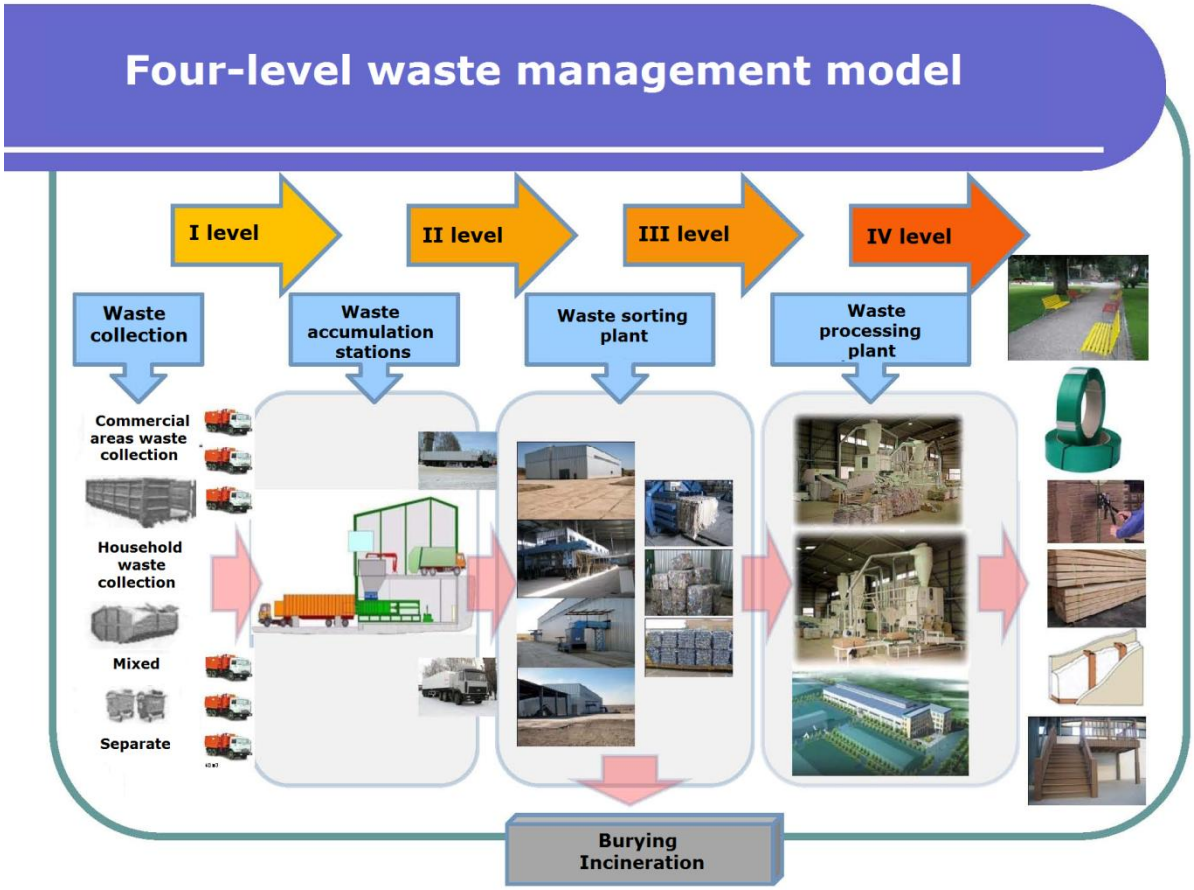

Figure 9. Waste management system for clusters in the Krasnoyarsk region (excluding Northern and Priangarski regions).

Source: Government of the Krasnoyarsk region 2010

The Concept is based on the four-staged system of waste management that is shown on the Fig. 9. The first stage of the scheme includes collection of both mixed waste and separated fractions (paper, glass) from households and commercial areas. According to the Ministry of Natural Resources and Forestry of the Krasnoyarsk region (n/a) separate waste collection is supposed to be insured by small and medium size companies existing in the region at the moment. Then all collected waste goes to the waste accumulation stations by means of small trucks (Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a) where it can be stored for a period up to six months according to the currently applied legislation

(Government of the Russian Federation. 1998a). To avoid unnecessary transportation expenses the next stage of the waste management system includes usage of large trucks directly to the waste sorting plants where recyclable waste fractions are separated and prepared for recycling itself.

The percentage of potentially recyclable waste was estimated to be up to 70% of the whole amount. The rest part of the waste stream is supposed to be either incinerated or buried (Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a). It is planned to use the existing waste sorting and processing facilities, such as, for instance, "Clean City" sorting plant, which is responsible for main investments in the Central cluster.

Each region has a comprehensive plan of the development with technical recommendation on organizing the waste recycling industries and logistic in the different geographical and socio-economic conditions. During the period of implementation of the planned activities, Rostekhnazor will decrease the number of waste burying limits distributed between waste management companies to encourage these companies to send waste to the sorting plants (Rykov).

According to the Ministry of Natural Resources and Forestry of the Krasnoyarsk region. n/a. and pesc. comm. with Rykov, the economic instruments that will be applied to the waste management companies include: tax incentives (regional corporation tax cut – 4%; property tax cut– 2.2%) and benefits from municipalities in terms of land loans.

The indicators of successful implementation for this program are shown in the Table 8.

Table 8. Waste management indicators established for the Concept of waste management development of the Krasnoyarsk region

	Indicators	**2010**	**2014**	**2020**
1	Amount of secondary resources extracted from municipal solid waste, thousand tonnes	40	140	340
2	Amount of secondary resources produced from production waste, million tonnes	0.9	2.5	7.5
3	Amount of production waste, disposed on environmentally complied landfills, million tonnes	15	17.5	22
4	Amount of municipal solid waste, disposed on environmentally complied landfills, thousand tonnes	410	520	650
5	Amount of production waste recycled, million tonnes	40	65	80
6	Amount of municipal solid waste recycled, thousand tonnes	80	250	800
7	Area of landfills rehabilitated, hectares	0	1000	2100
8	Amount of production waste landfilled, million tonnes	60	55	50
9	Amount of municipal solid waste landfilled, thousand tonnes	990	770	650

10	Amount of biological, medical and mercury-containing waste neutralized, tonnes	1000	1200	1600

Source: Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a.

To sum up, this program includes diverse measures for waste management sphere and takes into account regional specifics. Also it sets indicators and develops institutional and legislative framework, which can help to implement planned activities.

Programs of development for small and average-sized business

Regional governments of the subjects of the Russian Federation are in charge of favorable business environment development in their regions. Realizing the fact that the Krasnoyarsk region has quite a few of small and average-sized companies in the socially relevant spheres (especially in), the Government of the region developed several regional programs aimed to support business of this type.). One of the main programs is "Program of social and economic development of the region till 2010".

This program identifies the priority spheres of business development in the region, such as industrial production, housing and utilities services and business dealing with environmentally friendly activities/contributing to environmental protection (Government of the Krasnoyarsk region. 2010). The main instruments of the program are: interest rate subsidies, soft lending and development of institutions of micro-financing (Government of the Krasnoyarsk region. 2010).

This developmental program is followed by the "Concept of long-term development of the small and average-sized business in the Krasnoyarsk region for the period 2011-2013"

developed by the Ministry of Economy and Regional Development of the region. In addition to finance support, which is similar to the one from previous programs, it also includes wide range of information support programs to ensure awareness of business on existing opportunities (Ministry of Economic and regional Development 2010). However, despite the fact that entrepreneurs in waste recycling sphere are aware of this program, they didn't have chance to use it (Evstifeev, pers. comm.). This fact is confirmed also by a list of companies receiving financial support from the government (Official web-site on support for small and medium-sized enterprises in the Krasnoyarsk region 2011**)** it was explained by the fact that the program doesn't have enough finance resources for all entrepreneurs willing to participate (Evstifeev, pers. comm.) and therefore it is difficult to get such kind of support.

Chapter 6 - Analysis

6.1. Regional aspects

One of the most significant constraints to the effective waste management scheme implementation, which could be hardly overcame, is distances between settlements or/and waste recycling and storing facilities. It was mentioned several times during the interviews with different business representatives, that to transport the secondary material collected to the consumer they have to use railway, which significantly increase expenses (Evstifeev, pers.comm.). Therefore for business it is more profitable to collect waste fraction in European part of Russia with higher population density, smaller distances between cities and waste recycling facilities where they can decrease costs by using freight transportation. However, this issue depends mostly on railway tariffs formation and can be overcame with establishing partnership connection with railway company or by receiving additional finance support from the Government.

Also, with huge land resources, there is still enough space for waste disposing in the landfills and that is why problem seems to be not urgent for regional government.

6.2 Absence of comprehensive framework for solid waste management

Despite the existence of the Federal Law that governs waste management (including solid waste issues) there is no clear prioritizing of waste reduction in this legislative act. Taking into account the difference between Russian and international classification, it should be mentioned that this Law does include both “recycling” and “waste minimization” concepts. However, the waste hierarchy concept remains undeveloped; so far the main law includes only a list of possible activities, such as collecting, accumulating, using, neutralizing, storing, transporting

and burring of waste (Government of the Russian Federation. 1998a). There is no such measure as mandatory separate waste collection for population and/or companies.

The fact that the same regulatory mechanism applies for the whole amount of waste types also creates barriers for business participation. At that moment there is no differentiate approach to managing of fraction of municipal solid waste, such as packages, hazardous, electronic, biodegradable and bulky waste. Producers of packaging and electronic equipment are not responsible for waste generated and don't participate in recycling activities. That creates additional difficulty for small and medium-sized businesses engaged in waste fraction collection. This aspect will be discussed further in the *Market conditions* section.

Another shortcoming of the existing policy is a huge amount of different regulatory documents that govern waste management sphere. The list includes federal laws, secondary legislative acts, methodological recommendations, sanitation regulation and etc. Some of these legislative acts undergo constant changes; others remain untouched since the Soviet Union times. Most of these acts were established to ensure environmental compliance of industries, while very few of them actually govern solid waste activities. The role of business, as well as other stakeholders in waste recycling is not identified and economic regulation mechanisms to stimulate recycling activities are undeveloped. The whole legislative framework is designed to regulate waste from the position of landfilling, with the main regulatory mechanism represented by the limits distribution for waste burying. Thus, it results in absence of legal basis for waste recycling on lower levels, and unwillingness of regions to create secondary legislative acts on this matter. Accordingly, there is no enforcement of sustainable practices in waste management that would insure active stakeholders' participation in recycling.

As there is no Producer Extended Responsibility principle implementation, the business dealing with waste collection has no constant sales market amongst waste recycling and other

plants who are interested in secondary materials. This matter is discussed in the *Market conditions* section.

Thus, the legal environment that currently exists is undeveloped and at the same time overloaded with regulatory acts, and creates more obstacles for business participation than bring benefits for companies engaged in recycling.

6.3 State financing policy of waste management sphere

The state budget distribution is the main source of financing for the environment protection field, including development and implementation of the programs based on principles of private sector participation. At the present moment, sustainability development regulation issues have a low level of priority for the Government. It is reflected in the published budget distribution (Legislative Assembly of Russian Federation 2011) that currently enforced national budget for the period of 2011-2013 allocates only 0.21% of all finance resources for the whole environmental protection sphere (Legislative Assembly of Russian Federation 2011) and during the planning period of time the percentage is going to be decreased. This budget cuts create a threat for implementing of the "Concept of waste management system improvement in the Krasnoyarsk region" as the regional Government has financial obligations to the other parties.

As for the Krasnoyarsk region budget, the percentage of financial resources given for environmental protection department is 0.32% (399295.9 thousand of rubbles or 9982.4 thousand of Euros) for 2011 which is also planned to be decreased to 0.25% in 2013 (308694.6 thousand of rubles or 7717.3 thousand of Euros) (Legislative Assembly of the Krasnoyarsk region 2011). According to Legislative Assembly of the Krasnoyarsk region (2011), the distributed amount of money covers expenses of the landfill construction in Bogotol village planned for 2011 (18 152.2 thousand of rubbles or 453.8 thousand of Euros).

Except for that, finance support is given for the departmental program "Environmental protection" implementation that covers the "Concept of waste management system improvement in the Krasnoyarsk region" development as well. The whole amount of money given for the "Environmental protection" program implementation is nearly to be 28682 thousand of Euros (Legislative Assembly of the Krasnoyarsk region 2011), however only 5% of this money are given for solid waste management system improvement for the whole Krasnoyarsk region. The finance resources for the period between 2011 and 2013 are allocated only for information support ("Concept of development for solid waste management in the Krasnoyarsk region till 2020" write up) and pilot project for separate waste collection scheme implementation in Zheleznogorsk city (Legislative Assembly of Krasnoyarsk regio. 2011). Thus, the state budget distribution policy doesn't insure waste recycling policy implementation in a long-term period in the Krasnoyarsk region and doesn't motivate local authorities and municipal companies to develop system of waste recycling.

The problem of budgeting is especially acute on the municipal level as it was mentioned by governmental officials on both regional and municipal levels (telephone interview with municipal official, Rykov, perc. comm.). This problem will be described in more details in the section *Institutional constraints*.

To sum up, the current finance distribution both on national and regional levels does not create favorable environment for effective waste management from the side of public sector and is considered being insufficient.

6.4 Economic instruments for business sector

Economic instruments for the waste recycling activities encouragement are supposed to be governed primarily on the regional level by the government and other executive authorities The current federal legislation (for instance FL "On Environment Protection", "On consumption and production waste") includes very basic definitions of economic incentives that presume the further development of the secondary legislative acts to establish particular regulatory mechanisms. The Krasnoyarsk region Government, however, doesn't fully use this opportunity to promote sustainable practices in waste management. As it was mentioned by all business representatives there is no developed basis for incentives applied to the waste recycling sector from both legislative and finance point of view. At the same time they agreed that waste recycling business (whether collection, sorting or processing of waste) is hardly being profitable in existing economic conditions and tax cuts could help make this market more attractive for investments.

Tax policy changes are included in the "Concept of development for solid waste management in the Krasnoyarsk region till 2020" plan as it was mentioned before. However, the particular mechanism of benefits distribution is still have to be established as there is no draft legislative acts or policy programs, which are aimed to improve tax regulation.

Land-related issues were identified as one of the main discouraging aspect for waste recycling business. As waste recycling and sorting plants need a plot of land with communication and situated inside the city borders to compete with landfills, the land renting is one of the main expenditure item. Thus, land-related problems created obstacle for the first waste sorting plant in Krasnoyarsk ("Stroi+") on the very first stages of project realization, because company started to accrue debts related to land renting on the stage of plant constructing (Malchicov, pes. comm.). It was mentioned by other business representatives (Evstifeev, pers. comm.) that

land cost in Krasnoyarsk region is enormously high and business can't easily afford it. Therefore long-term costs with low interest or other

6.5 Governmental support of the small and medium-sized business

Despite the fact, that governmental authorities in the Krasnoyarsk region rely mostly on finance support from large business (such as waste recycling and sorting plants) in planned PPPs project implementation, small and average-sized business represents the majority of companies in the Krasnoyarsk region. Additionally, this business sector is included in the regional Concept "Waste management system improvement" as an intermediate between population and waste storing and sorting facilities for separately collected fractions (Government of the Krasnoyarsk region 2010).

According to the Program of the Krasnoyarsk region on small and medium-sized business sector support, environment-related business has high priority in the allocated funds distribution. However, some of business representatives showed low awareness about this program (phone interview with). The second problem appeared on the stage of finance obtaining, which is reflecting in the list of companies receiving money from the Government through this program on the official web-site. Interview results supported this evidence as entrepreneurs confirmed that they couldn't get any finance support (Evstifeev, Sydakov, pers. comm.) from the Government. Taking into account high competitiveness in the waste collection in the Krasnoyarsk region and other market-related issues

6.6 Institutional constrains

Institutional framework described in the Federal Law "On industrial and consumption waste" creates (Government of the Russian Federation. 1998a) an unfavorable environment for housing and utilities services sphere development, including waste collection. At the present

moment, regional and national governments have only regulatory and enforcement functions (Government of the Russian Federation. 1998a) while all waste collecting, transporting, utilization functions lie on municipal authorities. According to the regional database of Krasnoyarskstat major part of municipalities (especially in rural areas) don't have enough finance and labor resources to provide population with environmentally compliant and efficient waste utilization facilities. Therefore most part of waste is dumped illegally. Weak enforcement of environmental legislation by the executive authorities can not insure proper control on this issue. Additionally, municipalities differ significantly from each other and it hinders establishing connection between them, which is important because bigger projects on waste recycling in this region could help to reduce costs of implementation (Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a).

Thus, all interviewees mentioned this fact as the main obstacle for effective waste management scheme implementation for any region in the Russian Federation. At the present moment, the State Duma is preparing the legislative project in order to redistribute some of responsibilities (namely utilization) from municipal to the regional authorities. Indeed, this measure could significantly improve the regulatory mechanisms in the waste management sphere through better finance and administrative support in PPPs implementation, which was practically impossible on the municipal level. So far there is no exact date for discussion in Duma on this project, and therefore it is unclear when the enforcement of this legislative act will take place. Additionally, no specific secondary acts were prepared to insure the proper implementation of the new system. However, I assume that this legislative change if being enforced would significantly change the direction of further development of waste management sphere.

Besides for inadequate responsibilities delegation, there is no unified authority dealing with waste; different Ministries and Departments govern different waste-related issues without seeing the whole picture. Thus, Ministry of Natural Resources and Forestry of the

Krasnoyarsk region is responsible for environmental compliance and enforcement of waste management regulation, Ministry of Economic Development is dealing with business in this sphere, Housing and Utilities Department - with organizing of system for waste removing from population and etc. Some activities seem to be governing by several Departments, such as, for example waste transporting, which lies within range of responsibilities of Ministry of Natural Resources and Forestry and at the same time is regulated by the Housing and Utilities Department of the Krasnoyarsk region. This causes misunderstandings between actors and creates obstacles for effective waste management policy implementation.

6.7 Absence of reliable data

As it was said earlier, the data for waste management sphere is very incomplete. Basically, the information available from national and regional databases on this aspect includes only general trends for total amount of waste generated and collected. Furthermore, the information usually is published with a delay, so the most recent data at the present moment was collected in 2009. The officially existing system of national statistical accounting used by Rostekhnadzor and Rosstat allow collecting data only from legal entities dealing with waste through Federal Statistical Reporting Form (2TP-waste). Thus, there is no reporting on the amount of waste generated and its composition, but only on amount of waste collected and this data is not available for public. Additionally, huge territories of the region are not covered at all by the state controlling authorities (Ministry of Natural Resources and Forestry of the Krasnoyarsk region. n/a., telephone interview with municipal authority representative) and therefore almost all waste streams from rural areas remains unaccounted.

No scientific institution dealing with waste exists at the present moment, therefore precise statistical data, in-depth researches and long-term forecasts for waste management indicators (e.g. demand growth rate for recycled products, composition of the waste stream and

collected secondary materials) hardly can be found. Data used by governmental authorities for reporting and planning is imprecise and consists of estimates of the experts based on waste generation norms. An example of poor data usage by governmental authorities for policy development is amount of waste generated for urban and rural areas in the draft "Concept of waste management in the Krasnoyarsk region till 2020" (Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a) for percentage of potentially recyclable waste calculating. The numbers that appeared in this concept are 225 and 450 kilogram per year for urban and rural population respectively (Ministry of Natural Resources and Forestry of the Krasnoyarsk region n/a). At the same time, OECD report published for EECCA countries gives another ratios: 190-300 for urban and 90-150 cubic meters of waste generated for rural areas (OECD 2007). In the OECD report these numbers were obtained through experiments and explained by the fact, that rural and urban settlements have different waste compositions and in villages some part of biodegradable waste is composted and therefore is not included in the figure (OECD2007), which is also true for Russia. Therefore data in the Concept for the Krasnoyarsk region seems to include waste that could not be used in the industrial sector, as it was set in the plan.

The absence of reliable information about waste creates a serious obstacle for business dealing with recycling. Waste recycling projects (especially waste sorting and processing plants) have a long payback period and at the same time require huge investments. These conditions make such projects quite risky by definition and certainly involve detailed planning in order to avoid rude mistakes in a business plan. Therefore, absence of reliable information about existing market conditions is considered to be an important barrier to the efficient waste management policy implementation, planning and attraction of investments in the sphere of waste recycling.

Thus, private investments in the Krasnoyarsk region are limited by poor information environment and opaqueness and unreliability of the sphere.

Another policy issue associated with information support is a lack of "how to" guides for different groups of stakeholders. There are only legal methodological guides for municipal authorities and municipal services companies on tariffs calculation, but no guideline regarding waste minimization/waste recycling practices. Also there is no database on waste composition and best available technologies, which supposed to be an essential part of statistical system in waste aspects (Government of the Russian Federation. 1998a).

6.8 Environmental control and enforcement

The lack of effective controlling and enforcement mechanisms in environmental field resulted in a huge amount of waste buried without any environmental concern, especially in rural areas (Ministry of Natural Resources and Forestry of the Krasnoyarsk region. n/a.). Many municipalities don't have properly constructed landfills to utilize household waste with respect to legislative rules (Rykov, perc.comm.). According to Rykov, Prosecutor's officers frequently bring municipalities before a court because of waste was being dumped illegally due to poorly developed mechanisms of waste practices controlling. From business prospective this situation could result in a loss of potentially recyclable resources from this part of waste stream due to unsustainable practices been used for many years as a main way of waste utilization.

As it was mentioned in the literature review, the most part of existing landfills are also far from being environmentally compliant (Ministry of Natural Resources and Forestry of the Krasnoyarsk region 2010). The influence of environmental aspects to the recycling business performance will be described above.

6.9 Effect of environmental compliance on recycling business

Environmental performance of the landfills significantly influence large waste recycling companies in the Krasnoyarsk region with long payback period. It was mentioned by Malchicov that environmental compliance remains a crucial factor for disposal tariffs formation for waste transportation companies, which at the end will influence their choice of destination for waste. Since the landfills were constructed long time ago they don't have necessary environment protection systems and therefore are very cheap in exploitation. Thus, landfills have very low exploitation cost and are able to set very low tariffs for waste burring (35 rubles for 1 cubic meter). At the same time, tariffs for transportation companies sending waste to the sorting plant are being set on the higher level (75 rubles for 1 cubic meter) in order to cover construction and operational costs. Therefore waste sorting plant could not compete with landfills and had to lower tariffs to the level of 32 rubles (Malchicov, perc. comm) and work with negative profits. The chosen corporate policy at the end resulted in bankruptcy of the waste recycling plant in Krasnoyarsk with the negative final balance of -10 million of rubles (250 thousand of Euros) and criminal proceedings being initiated against the owner of the plant because of wages arrears. The same situation can be observed in other regions of Russia (Novosibirsk, Tambov) where waste recycling plant were closed or are nearly to be closed. As it was mentioned by Malchicov, without legal enforcement of environmental compliance of landfills the waste recycling plants won't be able to afford all expenses and will stay uncompetitive comparing to landfills.

6.10 Concepts of development

The Concept of the waste management system improvement in Russia described in the literature review is based on the socio-economic conditions existed in 2000 and therefore seems to be out of context. For instance, it describes the household sector mostly from

position of single family houses (Concept); whereas today the most part of population live in the multifamily houses. Additionally, it takes into account mostly European part of the country as the most developed one and never mentions difference between regions. Since the territory of Russia is not homogenous by population distribution, cultural aspects and economic development, the estimation cannot be applied for the whole territory (e.g. average distances for waste transportation). Another point is that since Gosstroy organization does not exist any longer, and there is an article stated that this authority is responsible for economic incentives regulation, it is unclear how and whom would provide waste recycling organizations with these benefits.

The Concept doesn't introduce the systematic approach to waste management, but only some odd unstructured methodological recommendations on waste collection and transportation, poorly described utilization options in housing and utilities services. It sets only main principles and definitions and didn't match the economic and social resources availability in the country at the present period. The positive feature of the Concept is legislative framework description, which could help to introduce the system of waste fraction collection from commercial areas and environment and sanitation regulatory mechanisms (which were implemented during the period from 2000 till 2010).

Being introduced in the period of intense economic development of the country, the concept hasn't resulted yet in any significant improvement of the waste recycling system in Russia. The situation observed in 2000 hasn't changed during the period of 10 years, which means that no implementation mechanism has been introduce to enforce this Concept realization after its releasing.

The Concept of "Waste management system improvement of the Krasnoyarsk region", however, uses the same principles as the national Concept, such as two-stage system of waste transportation and recommending of policy incentives implementation for recycling business

(without naming particular mechanisms, ways of implementing and deadlines). According to interview with regional government official, the government expects business to invest significant amount of money therefore the candidates for these investments are two waste sorting plants: “Stroi+” and “Clean city” (“Chistyi gorod”) who assumed to have sufficient asset. The small and medium business representatives engaged into secondary resources (paper, glass, plastic) collection from population and commercial areas are not considered in the plan. The concept was supposed to be officially accepted in 2010, yet the only part that was released by the government covers logistic planning for the Krasnoyarsk region with splitting it into clusters. During the time when policy paper were drafted one of the plants mentioned above was bankrupted and another one was engaged in the loan suit (Malchicov, perc. comm).

Also, according to plan, the waste is supposed to be recycled with local facilities, which can not process the whole amount of garbage generated on the territory of the whole region. At the present moment all recycling activity is taking place on the territories of other regions (Novosibirsk, some of European part of the country) because of the raw materials processing specification of the Krasnoyarsk industry, which can not use secondary resources in their production cycles. So there is some discrepancy between the planned level of recycling activity

Environment compliance enforcement for the landfills seems to be compulsory measure to ensure business engagement in recycling. However, without developed controlling system for transportation companies it will cause other environmental problems. As it was mentioned in the section *Effect of environmental compliance on recycling business* the tariffs for transportation companies could be raised at least twice in this case. Therefore, there is a probability that without proper enforcement of environment legislation transportation

companies will start to dump waste illegally. Also it will cause the social problems if the tariffs become higher for population.

6.11 Low effectiveness of governmental authorities

It was mentioned by Malchicov, that the level of qualification of the governmental officials is not correspond to the objectives established, which will not allow to design and implement a descent strategy for waste management system improvement. Although this question is quite doubtful, I should say that the main part of governmental officials used to deal with the Soviet Union methods of waste utilization and there is no educational programs organized for them in order to support with relevant information.

Another problem is associated with corruption, which still remains in a high level in the Russian Federation and low effectiveness of executive authorities (especially Regional department of Rostekhnador). During the series of checks made by Prosecutor General officials in 2011 it was shown that the level of effectiveness of this authority is quite low and can not insure policy environmental policies enforcement at the present moment. It is supported by the evidence from the annual Governmental reports, the Concepts of development and etc. which reflect the same environmental problems every year. (Ministry of Natural Resources and Forestry of the Krasnoyarsk region 2008, Ministry of Natural Resources and Forestry of the Krasnoyarsk region 2009, Ministry of Natural Resources and Forestry of the Krasnoyarsk region 2010)

6.12 Low level of cooperation between actors

Regional Government - as it was said in the previous subsection *Institutional constrains,* there are some structural features that hinder efficient information exchange on the level of

regional Government in the Krasnoyarsk region in the waste management sphere. It should be said that besides this, there is quite low cooperation between regional Governments of the different (even neighboring) regions (such as, for example Novosibirsk region). From observation made during the personal communication with the governmental official from the regional Government of the Krasnoyarsk region it became obvious that level of awareness of the situation in the other region is quite low. Thus, the principle of information support for the regional Governments stated in the Federal Law (Government of the Russian Federation. 1998a) is not implemented

Municipal companies – there is no mentioning about budget distribution for any of environmental performance improvement program in the sphere of housing and utilities services. The most part of the budget is given for subsidizing of vulnerable parts of society and other social programs (e.g. national program "Affordable housing") (Legislative Assembly of the Russian federation 2011). Thus there is a very low actual capability for introducing of new environmentally-friendly activities in housing services sector without any finance support.

Additionally, it is stated in the "Methodological recommendations for tariffs calculation" (Ministry of Regional Development 2011) designed for the municipal authorities in for establishing the tariffs for municipal companies (mostly transportation) that if municipal company improved energy and material efficiency it is not lead to long-term tariffs changes. Thought the phone interview conducted with one of the municipal company representative, the programs of environmental development is never being implemented officially in the company and the Department that suppose to deal with this issue is undergoing the constants changes (interview). Thus, municipal companies have very low capability for environmental performance improvement and cooperation as there is no stimulation mechanisms designed for.

Municipalities – this issue was discussed before in the subsection Institutional constraints. According to the Concept of the "Waste management system improvement" the large waste sorting, storing and recycling facilities are suppose to be constructed during the PPPs implementation. However, so far there is a serious problem of establishing connections between municipalities, as in many cases they are characterized by low level of infrastructure and administrative development. That will require additional effort on policy enforcement during the implementation period and therefore in the conditions of a lack of qualified labor could create difficulties for business engaged in the projects.

Additional problem that was discovered during the research is connected to the selective collection of the waste fractions. It should be said that, in general, secondary resources in Russia have quite low cost and taking into account low environmental awareness level, secondary resources collection have no real value for the most part of population. Therefore, almost only people with low level of income are interested in the money obtained through secondary materials collection. As it was mentioned by almost all entrepreneurs (///) engaged in the waste fraction collection, most part of these people are homeless and that is why municipal authorities are unwilling to participate in recycling centers organizing in order not to attract them in their municipal areas.

Business – there is no evidence of collaborative relations established on the regular basis between business and governmental authorities. The only company mentioned in the plan for clusters' formation in the Krasnoyarsk region is "Clean City" ("Chistyi Gorod"), that suppose to insure the finance support of the PPPS projects. In terms of small business representatives, they mentioned that nobody normally collaborate with them or ask them about their attitude on the policy decisions.

6.13 Market conditions

There is no developed market for secondary resources in both Krasnoyarsk region and the Russian federation. The World Economic Crisis of 2008 showed the vulnerability of the recycling business. It was mentioned before in the subsection *Absence of comprehensive framework* that business doesn't have guaranteed consumer for the collected secondary resources as there is no obligations for the producers to conduct any recycling activity. Therefore, when market prices for the raw materials went down in 2008, most of the recycling companies in the Krasnoyarsk region were bankrupted, as producers who got raw materials for a very low price refused to buy secondary resources form waste collecting companies. This problem caused by general economic situation in Russia as it remains clearly resource orientated and highly dependant from resources export.

The other reason for business being insufficient is high tariffs policy for transportation, electricity and water supply which are constantly growing. There are no incentives applied on this matter for business dealing with recycling. Increase of the tariffs for transportation, electricity and water supply also affecting business, especially large companies.

At the same time, utilities and housing service market still shows a clear tendency for monopoly as municipal companies associated with public sector (although they could be private) don't have much competitors. Population usually don't have any chance to choose the company that provides waste utilization services. The waste utilization scheme itself is not flexible and don't allow different actors to participate.

6.14 Social issues

The work is focusing mostly on policy issues; however, it was investigated during the research, that social component plays crucial role in waste strategy improvement.

The problem of low awareness creates serious obstacles for policy implementation, as people are unwilling to cooperate with government on this matter. There are no educational materials or guidelines for population even in urban area about environmental component of recycling and about how to recycle. Although people are aware of adverse impact of waste, without developed infrastructure they are not willing to recycle. It is caused by inconvenience of drop-off points, the presence of homeless people there and low price for secondary materials. Thus, business in the Krasnoyarsk region is mostly small-scaled and therefore quite vulnerable.

6.15 Synopsis

It was mentioned that different factors are influencing different types of business in waste recycling sector. Thus, for the large companies, such as waste sorting and recycling plants, the land renting issues appear to be the most important aspect. At the same time, small and average-sized business representatives were more concerned about population participation and absence of cooperation with municipal authorities. All business representatives participated in the research identified insufficient tariffs regulation as an important barrier for further development of their business.

Waste recycling is still considered by some stakeholders, namely business or population, only from the economic perspective. Regulatory authorities, in contrary, are concerned mostly about environmental compliance of industrial companies and landfills. Thus, the Government utilizes mostly restrictive mechanisms of regulations instead of applying of incentives to encourage population and business to participate in waste minimization activities.

The fact that waste recycling is treated mostly from economic point of view without any environmental concern does not allow to further develop the market as this development is restricted by economic conditions in Russia.

Chapter 7 - Conclusion and recommendations for further research

7.1 Conclusion

The goal of this research was to contribute to the waste management system development in the Russian Federation in order to improve environmental performance of the country. Therefore, I put the main effort on analyzing of the socio-economic factors and policy gaps using Krasnoyarsk region example as a case study. It was discovered, that there are some significant drawbacks of the currently established waste management system, which could discourage business to participate in the improved waste minimization scheme through public-private collaboration.

First of all, the country still has strong top-down governing of the environmental activities with low level of concern about environmental impact of waste recycling. Therefore policy withdraws can be hardly mitigated by other stakeholders actions. Some characteristics of the waste management policy discovered during the research are as follow:

- Absence of the comprehensive legislative and intuitional framework for solid waste management recycling;
- Low priority of waste management sphere in finance policy on both national and regional levels;
- Limited use of economic instruments for private sector support;
- Weak controlling and enforcement mechanisms for environmental policy implementation and compliance;

However, a lack of environmental awareness amongst the population is also considered to have significant influence on business sector participation. Also, it was shown that current economic conditions remain unfavorable for this kind of business and therefore business sector development can not be enforced only by economic drivers without any environmental

concern. Another important barrier for policy implementation is a very low level of information exchange between all groups of stakeholders and absence of reliable information.

All these factors can influence the PPPs project implementation on waste-related issues, which are planned by the Government of the Krasnoyarsk region. As policy implementation is insured mostly by regional government the main effort should be put on improvement of enforcement mechanisms with simultaneous change of national policy toward the encouragement of more sustainable practices.

7.2 Areas for future research

In the context of this study several potentially perspective topics for further research were discovered:

(a) Research on social drivers and barriers that could influence recycling rate in Russia. For example, this thesis doesn't cover PPPs with NGO participation, however, during the research it was investigated that non-governmental organizations serve as an important intermediate between recycling business and population. Also, there are almost no studies that cover social perception of recycling in Russia;

(b) Research on economic factors that affect private sector in recycling;

(c) Comparison of different regions performance in terms of waste recycling system implementation. It could be worth to study the successful examples of public-private collaboration in waste management policy implementation and to investigate what are the criteria of success in the current economic and social conditions.

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Appendix 1 – Personal communications

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2. Sydakov I. V. Business representative. General director of “Vtorresurs 24”, Formal interview, 25 May 2011

3. Evstifeev, G. Business representative, glass recycling company, Formal interview, 23 May 2011

4. Malchicov, E. Member of the Coordinating Council of the Krasnoyarsk Regional Branch of Liberal Party. Councelor of “Stroi+” company. Formal interview, 15 May 2011