

EU-TEMPUS Project

TIWaSiC

“Advanced Training in Integrated Sustainable Waste Management for Siberian Companies and Authorities”



WORK PACKAGE 2 “Preparation”

OUTCOME REPORT

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1 OVERALL STATE OF WASTE MANAGEMENT IN FOUR TEST REGIONS

1.1 ZabaykalskyKrai

In ZabaykalskyKrai waste is produced by the enterprises of following sectors:

- fuel and energy sector,
- metallurgical industry,
- mining industry (tailing dumps),
- timber industry, wood processing industry,
- construction industry,
- transportation and traffic sectors,
- as well as by other sectors.

One of the main environmental problems in ZabaykalskyKrai remains the problem of waste management, which includes

- disposal and treatment of waste, in particular, accumulated industrial waste;
- involvement of waste in circular economy as secondary raw material;
- the need to eliminate the results of past environmental damage;
- the need to reduce the amounts of waste disposed, treated, incinerated in an environmentally friendly manner;
- the need to build new facilities for waste disposal (landfills), that conform to modern environmental and sanitary requirements;
- the need to decontaminate territories that were damaged due to waste disposal;
- the need to execute projects aimed at embedding modern technologies of waste treatment and waste disposal.

Based on the reports of the form 2TP (Waste)¹ for the period of 2012-2013 yrs. a total amount of waste of different hazard classes² was revealed (see Table 1).

Among the 12 regions of Siberian Federal District, Transbaikal is placed 6th based on the amount of waste produced. In many populated areas there the territories near roads have been turning into illegal dump sites.

The amounts of waste produced in ZabaykalskyKrai have been rising year on year. According to the inventory at the end of 2013, the amount of waste reaches around 78 million Mg, including the accumulated environmental damage of past years, the most common type of waste being mill tailings and tailing pounds, mullocks and refuse heaps of low grade ore.

Despite all the difficulties, in particular the lack of substantial financial support, the work was set up at a higher level in 11 out of 31 municipal districts: Chita, Aginsky, Akshinsky, Baleisky, Borzinsky, Duldurginsky, Karymsky, Olovyanninsky, Petrovsk-Zabaykalsky, Sretensky and

1 2TP (Waste) is one of the three environmental statistical reports, called 2TP reports (Air, Waste, Water) that companies have to deliver to the authorities.

2 Compared to Europe, wastewil be classified in five hazardclasses,depending on the degree of negative impact on the environment

Tungiro-Olekminsky regions.

Table 1: Industrial and consumer waste production in ZabaiyalskyKrai in several hazard classes in 2012-2013

| Metrics | Total | Hazard class | | | | |
|---|-----------------|--------------------------------------|------------------------------------|---|------------------------------|--|
| | | I class extremely hazardous waste | II class highly hazardous waste | III class moderately hazardous waste | IV class low-hazard waste | V class virtually non-hazardous waste |
| Amount of produced waste [Mg] | 198.244 million | 20 | 198 | 46,642 | 177.196 | 178,260 |
| Amount of recovered and treated waste [Mg] | 105.064 million | 0 | 48 | 2,586 | 67.880 | 104,994 |
| Amount of disposed waste ³ [Mg] | 131,718 | 0 | 0 | 4 | 42.260 | 89.454 |
| Amount of waste transferred for storage ⁴ [Mg] | 4,142 | 0 | 0 | 2 | 726 | 3.414 |

In Kalgansky and Nerchinsko-Zavodsky regions the work of local government authorities for consumer waste is carried out strictly unsatisfactory. The majority of waste is produced while mining and processing raw materials. In 2013, 86 unauthorized dump sites were detected in ZabaykalskyKrai, which amounts to 400 ha of territories. 47 of these dump sites were eliminated. Areas for waste disposal in ZabaykalskyKrai were defined (see Table 2).

Table 2: Available waste disposal facilities

| Metrics | Results for 2013 |
|---|------------------|
| Total number of authorized waste disposal facilities [units] | 526 |
| Area size of authorized waste disposal facilities [ha] | 1,041 |
| Number of unauthorized dump sites detected [units] | 202 |
| Number of unauthorized dump sites eliminated during the reported period [units] | 512 |

³ According to the Russian Federal Law “On industrial and consumer waste” dated June 24th, 1998, No. 89 FZ “Law on Waste” (last edition from 28.12.2008), waste disposal is isolation of waste which cannot be further re-used, in special storage facilities in order to prevent the penetration of hazardous substances into the environment.

⁴ According to the Russian Federal Law “On industrial and consumer waste” dated June 24th, 1998, No. 89 FZ “Law on Waste” (last edition from 28.12.2008), waste storage is keeping waste in special storage facilities in order to dispose, treat or use it further. Waste storage is provided for a term of maximum three years.

The region does not have landfills for solid domestic waste that would conform to modern requirements. The existing landfills do not comply with the sanitary norms and regulations, they do not follow the basic maintenance requirements: there is no fencing, the waste is not packed together to reduce its volume. The investigations of waste disposal sites showcased the presence of hazardous substances, such as lead and cadmium.

There exist districts with comparable financial capabilities that have organized waste management at a high level: Aginsky Buryat district, Krasnokamensk and Krasnokamensky district, Sretensky district. In Shilkinsky, Petrovsk-Zabaykalsky and Olovyanninsky districts the work on waste management is considered satisfactory, in all other districts it is considered unsatisfactory.

One of the most problematic types of waste in every region is solid domestic waste. Town Chita produces the majority of them (84%). The rate of waste production per capita is quite high in the test region – 4.5 Mg per man per year. Meanwhile waste recovery is virtually not present in the region: only 0.7% of all produced waste is recovered.

ZabaykalskyKrai has accumulated considerable amount of mining industry waste: mill tailings and tailing pounds, mullocks and refuse heaps of low grade ore, waste produced by different enterprises and public utilities. Thermoelectric power stations and boiler houses produce a lot of bottom ash waste, since the majority of them burn coal. As a rule, waste is stored in hydro-ash-disposal areas that do not have impervious membrane. This results in contaminating groundwater with heavy metals, arsenic and sulfur. In addition, dusting of spent materials and soil contamination take place.

In order to collect solid domestic waste, a single-stage scheme is used in the region. The waste is collected from territories into special containers, located in sanctioned places, and then it is delivered to the dump sites by purpose-designed vehicles. Only in town Chita a project aimed at sorting solid domestic waste has been launched in 2012. At the moment unauthorized dump sites on the road borders, in sanitary protection zone of cities and villages are appearing at a massive scale. All of this deteriorates the region quality standards.

The increasing amounts of waste production result from the growth of stripping soils that are left after the processing of raw materials – 5th hazard class (coal strip mine “Kharanorsky”, coal strip mine “Vostochny”, coal strip mine “Urtujsky”, coal strip mine “Apsatsky”).

The majority of toxic waste is produced by large manufacturing enterprises of ZabaykalskyKrai (OJSC “Priargunsky manufacturing mining and chemical association”, Chitinskaya TPP-1 (SDPP), Chitinskaya TPP-2).

In the housing and utility sector enterprises of ZabayalskyKrai the problem of collecting and transporting the solid domestic waste from the populated areas of private housing is only partially solved; waste disposal and recovery is not organized. Main places for waste disposal are landfills of solid domestic waste and authorized dump sites. Most enterprises that deal with waste management in housing and utility sector only do waste transportation and its disposal at the landfills Waste recycling is almost not performed. Sewage treatment plants of town Chita require reconstruction.

In mining enterprises of the region waste production has risen due to the increase in workload of prospectors' co-operative associations.

Production of most waste falls to the share of mining pit coal and brown coal, ore and sands of precious metals.

Refuse heaps of low grade ore, that are common in all mines, pose considerable risk. The content of harmful substances in this type of waste is comparable to that of mill trailings, however, environment control measures are usually not provided.

Co-operative associations of prospectors mine valley placers, which leads to contamination

of large areas of most fertile soils, dislocation of surface streams, as well as to creation of large amounts of refuse heaps of stripping soils. Thus, for the period of 2007-2013 yrs a total of 15.6 ha of land was infringed, 11.2 ha of it falling to the share of prospectors' associations.

Most part of the waste produced by **logging and wood processing industry** is incinerated in boiler houses and is sold to the general public for household purposes. A number of investment projects related to treating waste from wood processing industry has been launched in the region. They focus on waste reception, crushing, sorting and subsequent recovery into industrial chips, as well as on reception, fragmenting, drying and treatment of waste into fuel bricks and pellets.

1.2 PrimorskyKrai

Main problems in the area of waste management in PrimorskyKrai are:

- insufficient amount of landfills of solid domestic waste that conform to sanitary and environmental requirements;
- a big number of unauthorized dump sites for solid domestic waste;
- underdeveloped infrastructure for waste recovery, recycling and disposal;
- absence of approved general schemes for cleaning the territories of municipal entities of the region;
- insufficient financial support of events and campaigns dedicated to waste management;
- absence of state measures supporting waste management.

Based on findings of the Federal Supervisory Natural Resources Management Service (Rosprirodnadzor) for PrimorskyKrai in 2013, a total amount of waste of different hazard classes was identified (see Table 3).

Table 3: Waste management in PrimorskyKrai in several hazard classes in 2012-2013

| Metrics | Amount of waste per class [Mg/a] | | | | | Total |
|--|--|--|---|---------------------------------|---|---------------|
| | I class extremely hazardous waste | II class highly hazardous waste | III class moderately hazardous waste | IV class low-hazard waste | V class virtually non- hazardous waste | |
| Existing waste at the beginning of year | 20 | 280 | 13,310 | 26,230 | 1,058,648,990 | 1,058,688,830 |
| Waste production | 60 | 80 | 49,530 | 3,684,190 | 37,827,930 | 41,561,790 |
| Waste received from other organizations | 80 | 370 | 13,950 | 262,970 | 151,540 | 428,910 |
| Waste recovered and treated at enterprises | 20 | 280 | 55,030 | 509,450 | 3,945,440 | 4,510,220 |
| Waste transferred to other organizations | 130 | 210 | 23,130 | 230,530 | 155,460 | 409,460 |
| Waste disposed at in-house sites | 0 | 10 | 210 | 146,490 | 49,241,800 | 49,388,510 |
| Waste at the end of year | 10 | 240 | 930 | 29,400 | 1,083,160,630 | 1,083,191,210 |

Spent solutions of electroplating and waste mercury lamps comprise considerable amount of waste of class I.

Spent batteries (undrained), spent battery sulfuric acid, spent battery alkali prevail in class II.

PrimorskyKrai produces large amounts of waste of class III, such as waste from emulsions and blendings of oil products, floating film from oil catchers, spent railway ties, soaked with antiseptics.

Waste of class IV includes waste from mining industry (mill trailings), stripping soils from mining construction raw material, bottom ash waste from burning coal, bark and timber waste from logging and conservation, waste that comes from mechanical and biological sewage water treatment, waste from dump wells, utility fluids, utility waste and consumer waste.

Stripping soils and barren rock from mining industry, bottom ash waste from burning coal, scrap metal, timber waste from logging and conservation prevail in class V.

It has been established that the annual amount of solid household waste production in the region exceeds 1 millionMg.

10 municipal entities of the region are equipped with landfills: Arsenyevsky city district, city district of closed administrative-territorial unit BolshojKamen, Vladivostoksky city district, Nahodkinsky city district, Partizansky city district, Spassk-Dalny city district, Ussuriysky city district, city district of closed administrative-territorial unit Fokino, Kirovsky municipal district, Terneysky municipal district.

Total residual landfills capacity comprises 2,670,000Mg. Given current rates of waste accumulation, calculated operational life of various landfills does not exceed 3 years.

As of the end of 2013 – the beginning of 2014, in PrimorskyKrai there are 89 authorized dump sites and over 100 unauthorized dump sites for waste disposal.

On the enterprises of housing and utility sector of PrimorskyKrai the problem of collecting and transporting the solid domestic waste from the populated areas of private housing is only partially solved; waste disposal and recovery is not organized. Main sites for waste disposal are landfills of solid household waste.

In most municipal entities of the region municipal waste disposal is done solely by transporting the waste to waste disposal sites that do not have environmental constructions and that are often located in the land areas that, according to the current legislation, are not intended for waste storage.

The infrastructure for waste recovery is almost not being developed in the region, the cities of Ussuriysk and Vladivostok being the only exceptions. They have modern waste sorting facilities and landfills for disposing non-recycled waste. Waste incineration for the purpose of producing heat energy is performed on a specialized plant in Vladivostok.

PrimorskyKrai has 14 ash-disposal dumps. The region has accumulated over 155.6million Mg of bottom ash waste, including the dumps in Pozharsky municipal district, Luchegorsk village (48.5 million Mg), Artemovskiy city district (46.5 million Mg), Vladivostoksky city district (42.1 million Mg), Partizansky city district (17.4 million Mg), Ussuriysky city district (approx. 1.0 millionMg).

PrimorskyKrai has a highly developed diversified **mining industry**. Several big ore mining and processing plants of national status are located in the region: OJSC “EnergomashBor”, JSC “Dalpolimetall”, CJSC “Primorsky mining and processing plants”, OJSC “Yaroslavskymining and processing plants”, OJSC “Spasskcement” etc. It has been found that the region's mining enterprises produced 35,800,700 Mg of waste in 2012, which constitutes 86% of the total amount of waste for that year.

In PrimorskyKrai pit coal and brown coal is mined at a large scale for the energy needs of the region. The majority of waste is produced by big mining enterprises, such as:

- OJSC “DGK Division Luchegorsky coal pit mining
- CJSC “mining and chemical plantBor”
- LLC “Yaroslavskayamining enterprise”
- Open-pit mine “Porechensky” etc.

Hence, the majority of waste in the region consists of stripping soils, adjacent soils, bottom ash waste, tailings, fine pulps and other waste products of mined ore and non-metallic raw materials.

1.3 The Republic of Buryatia

One of the main environmental problems in Buryatia remains the problem of waste management, including separate waste collection and recovery, management of waste that comes from construction and demolition, package materials, as well as the existence of unauthorized dump sites.

Based on the reports of the form 2TP (Waste) for the period of 2012-2013 yrs, a total amount of waste of different hazard classes was identified (see Table 4).

Table 4: Waste production in the Republic of Buryatia in several hazard classes in 2012-2013[Mg/a]

| Hazard class | year 2012 | year 2013 | 2013 to 2012 in % |
|-----------------------|------------|------------|-------------------|
| Total amount of waste | 29,008,351 | 59,065,600 | 203.6 |
| hazard class 1 | 33 | 30 | 90.9 |
| hazard class 2 | 80 | 94 | 117.5 |
| hazard class 3 | 119,290 | 151,219 | 126.8 |
| hazard class 4 | 96,882 | 85,819 | 85.6 |
| hazard class 5 | 28,792,066 | 58,828,420 | 204.3 |

The increase in waste production rates in 2013 results from the increased amount of stripping soils, that come from mining coal deposits – 5 hazard class (LLC “Ugolniyrazrez”, LLC “Bain-Zurhe”).

The largest amount of toxic waste is produced on big industrial enterprises of Ulan-Ude (OJSC “Ulan-Udensky aircraft factory”, Ulan-Udensky LVRZ – Division of OJSC “RZD”, Ulan-Udenskaya TPP-1, Ulan-Udenskaya TPP-2). Industrial waste is disposed in 5 authorized sites:

- industrial waste disposal site in Matrosova village is aimed to store industrial waste from Ulan-Udensky LVRZ – Division of OJSC “RZD Russian Railways”. The area size of the site is 7 ha. Calculated site capacity (former clay pit) is 1,000,000 m³;
- industrial waste disposal site located on an air field in Zagorsk village is aimed to store toxic liquid industrial waste from OJSC “Ulan-Udensky aircraft factory”;
- bottom ash waste disposal site of Ulan-Udenskaya TPP-1 in Kirzavod village (the so-

called intermediate bottom ash waste site). The area size of the site is 12 ha. Calculated site capacity is approx. 150,000,000 Mg. The site is used in winter time; it is filled annually up to the point of 586 m, with the accumulation of 60,000 to 150,000 Mg; in summer time bottom ash waste is pumped to the permanent disposal site in Talcy village;

- bottom ash waste disposal site of Ulan-Udenskaya TPP-1 near Talcy station (permanent disposal site). The area size is 102 ha. Calculated site capacity is approx. 8,067,370m³. (8,560,000 Mg). The first section of the site is fully filled (capacity 3,680,900 Mg). The second section of the site (capacity 4,880,000 Mg) has been used since 2000. Calculated operational lifespan is 13 years;
- bottom ash waste disposal site of Ulan-Udenskaya TPP-2. The area size is 10.3 ha. Calculated capacity is approx. 394,000 m³. (500,000 Mg). Calculated operational lifespan is 3 years. Bottom ash waste disposal site “Malinovy log” (capacity – 615,000 Mg, area – 147.2 ha) is under construction.

In the housing and utility sector enterprises of the Republic of Buryatia the problem of collecting and transporting solid household waste from the populated areas of private housing is only partially solved. Main sites for waste disposal are landfills for solid household waste and authorized waste disposal sites.

Waste recovery is almost not organized and takes place in a small way. Only small enterprises are engaged in waste recovery: production of heat-insulating materials from waste (crushed glass), production of bricks and other products manufactured from dried sludge, plastic and paper recycling.

Sewage water treatment facilities in Ulan-Ude require reconstruction; drainage of sewage sludge is done on mine sites, then the sludge is transported to the landfill of solid domestic waste.

In mining enterprises of the region the waste production has increased due to the increase in workload of prospectors' associations. The rate of recovered waste in the enterprises reached 16.5%, the rate of treated waste reached 0.7%. Waste disposed: on waste disposal sites (authorized disposal sites, landfills of solid household waste) – 175,500 Mg; on in-house waste disposal sites – 1,741,000 Mg.

Production of most waste accounts for mining pit coal and brown coal (81.2%), ore and sands of precious metals (12.2%). The majority of waste is produced as a result of mining raw materials. The share of waste from this type of activities in the total amount of waste production in Buryatia is 95.17% in 2013 (92.9% in 2012).

Waste from coal processing and sintering by OJSC “Tugnuisky coal-preparation plant” is disposed in the open pit of mining “Tungussky”.

Currently LLC “Zakamensk” carries out a project on tailing dumps recovery of Dzhidinsky tungsten-molybdenum plant.

The majority of industrial tailings are located in 4 different sites:

- gravity preparation waste of ore from Holtoson deposit (3.8 million Mg in the area of 20.1 ha);
- mill tailings of ore from Inkursk (approx. 37 million Mg);
- heap of pulp emergency release, where blending of rock refuse is located (approx. 1 million Mg);
- site in the creek of Modonkul river (area size 1 x 2.5 km), where the largest amount of rock refuse of molybdenum ore is located. The latter is the least studied type of waste coming from the factory. A certain fraction of waste is recovered, while the majority of waste is relocated for storing to another site in the forest area. The deterioration of

the environmental situation in the town of Zakamensk is caused by the transportation process of some part of the waste, namely of sand from spoil heaps and tailings from processing plants of the tungsten-molybdenum plant.

Most part of the waste produced by **logging and wood processing industry** is incinerated in boiler houses and is sold to the general public for household purposes. A number of investment projects related to recovering waste from wood processing industry has been launched in the region. They focus on waste reception, crushing, sorting and subsequent into industrial chips, as well as on reception, fragmenting, drying and treatment of waste into fuel bricks and pellets.

Cellulose and paper industry is represented in the region by OJSC “Seleginsky cellulose-cardboard plant”. Given current economic situation, the plant’s usage or recovery of waste coming from timber sawing, wood processing, cardboard and paper is insignificant. The plant operates following the drainless scheme under the condition of closed-loop water cycle that was introduced in August 1990 (the plant does not discharge sewage water). However, currently the industrial site of the plant has accumulated sewage sludge, and the problem of its treatment and disposal has not yet been solved.

Metallurgical industry of the Republic of Buryatia is represented by one enterprise, “Ulan-Ude Stalmost”, which produces metal bridge conduit and industrial steel structures. Recovery of metal waste is done in-house.

The following entities are responsible for **waste recovery**: “Republican waste recovery factory” (used tire, medical waste); IE “Tonkonogov D.S.” (mercury lamps, different plastics, glass waste, medical waste, paper waste, oil-impregnated waste, spent oils), that uses incineration as the main means of waste treatment; OJSC “Ulan-Udensky aircraft factory” (mercury lamps).

Following the order №8-PRof 15.01.2013, a classificatory catalogue of waste types of the Republic of Buryatia was created, which based on Russian Federal Classificatory Catalogue of Wastes.

1.4 Irkutsk Oblast

In Irkutsk Oblast the main sources of environmental pollution caused by waste remain enterprises of fuel and energy complex, timber and wood processing industries, housing and municipal services.

Federal special-purpose program “Protection of Lake Baikal and social-economic development of Baikal natural area for 2012-2020” (hereinafter – the Program) operates in the Irkutsk Oblast. The Program envisages a series of measures: to assess the environmental situation of the area; to develop and implement means of state support for reducing and elimination of environmental damage that was inflicted by past economic activity; to develop a set of specially protected natural areas of federal importance etc.

The goal of the Program is to protect Lake Baikal and Baikal natural area from adverse impact of anthropogenic, technological and natural factors. To reach this goal, a set of sub-goals was created: to decrease the waste contamination level in Baikal natural area, to guarantee the restoring of territories that had undergone high and extremely high contamination.

One of the most important target indicators of the Program is the decrease in the amount of waste that is just disposed in the landfills.

The Program foresees funding for the following activities:

- (re-)construction of waste management facilities (landfills of solid domestic waste,

waste sorting and waste reload stations);

- construction of engineering structures and bank protection structures to protect populated areas and economic entities from floodwater;
- construction(modernisation) of waste water treatment plants.

All these activities will directly and indirectly decrease the adverse impact of waste.

Following the mandate of the President of Russian Federation, a sub-program “Industrial and consumer waste” was developed in Irkutsk Oblast for the period of 2011-2015. Activities in the area of industrial and solid domestic waste management are included into the long-term special-purpose program “Environmental protection in Irkutsk Oblast for 2011-2015 years”.

The sub-program was developed by the Department of natural resources and ecology, the Department of housing and building and the Department of road facilities of Irkutsk Oblast. Its goal is to prevent and eliminate the adverse impact of consumer waste on the environment and health of local population while maximally engaging the use of waste in circular economy. In particular, implementing the activities of the sub-program will allow to eliminate 220 Mg of waste pesticides and toxic chemicals and to increase the amount of recovered waste by 2016. Apart from that, it is planned to demercurize a unit of mercuric electrolysis in Usolye-Sibirskoe and to eliminate arsenic contamination in town Svirsk.

The total amount of sub-program funding coming from the regional budget is 188.5 million RUB, anticipated revenues from municipal entities budget is 14.6 million RUB, from non-government sources – 2.5 billion RUB.

As part of the Action plan for implementing the state policy in the area of environmental development in Irkutsk Oblast for the period till 2030, the following steps will be undertaken:

- ✓ implementing of activities of the sub-program “Industrial and consumer waste in Irkutsk Oblast for the period of 2011-2015” of the long-term special-purpose program “Environmental protection in Irkutsk Oblast for 2011-2015 years”, namely:
 - construction of a waste recovery plant in Angarsky district,
 - establishment a regional catalogue of waste,
 - construction of a landfill of solid domestic waste in Irkutsk,
 - construction of a waste sorting plant in Irkutsk with a capacity of 300,000 Mg/a,
 - creation of a network of modern waste reload and waste sorting stations in Irkutsky, Olkhonsky, Slyudyansky districts,
 - construction of a landfill of solid domestic waste in Irkutsky, Olkhonsky, Slyudyansky districts;
- ✓ implementing of activities of the federal special-purpose program “Protection of lake Baikal and social-economic development of Baikal natural area for 2012-2020”, including:
 - creation of a network of modern waste reload and waste sorting stations in Irkutsky, Olkhonsky, Slyudyansky districts,
 - construction of a landfill of solid domestic waste in Irkutsky, Olkhonsky, Slyudyansky districts,
 - construction of a landfill of solid domestic waste in Irkutsk,
 - construction of a waste sorting plant in Irkutsk;
- ✓ developing and adopting a regional long-term special-purpose program for the period till 2030, which will focus on waste management, in particular: **on establishing mechanisms of economic incentive for waste management enterprises of Irkutsk Oblast that use low-waste and resource-efficient technologies and equipment;**

- ✓ assessing how enterprises of Irkutsk Oblast comply with environmental protection laws on waste management;
- ✓ taking inventory of waste, revealing unauthorized waste disposal sites:
- ✓ ensuring environmental safety of medical waste turnover in accordance with Sanitary regulations and standards 2.1.7.2790-10 “Sanitary-epidemiological requirements for medical waste handling”.

In scope of implementing **the long-term special-purpose program “Environmental protection in Irkutsk Oblast for 2011-2015 years” the following is accomplished:**

In 2012 abandoned pesticides and toxic chemicals of hazard classes I-IV were disposed in a specially equipped landfill (in Angarsk) from the following regions: Alarsky, Angarsky, Balagansky, Bayandaevsky, Bokhansky, Zhigalovsky, Zalarinsky, Irkutsky, Kachugsky, Kirensky, Nizhneilimsky, Osinsky, Usolsky, Ust-Udinsky and Ekhirit-Bulagatsky district, Bratsk and Irkutsk. In total, 103,057 Mg were relocated for the period of two years.

In 2013 the last portions of abandoned pesticides and toxic chemicals of hazard classes I-II (19 Mg) from Bratsky, Ust-Udinsky and Ust-Kutsky district were disposed. In total 122 Mg were disposed for the period of three years.

Project documentation for the construction of landfills of solid domestic waste was created for Nizhneudinsky, Sludyansky, Cheremkhovsky and Ekhirit-Bulagatsky district.

A landfill of industrial waste was constructed on the site Severny 5 in Cheremkhovsky district; waste from the industrial site of Angarsky metallurgical plant in Svirsk was disposed.

According to the statistical report 2TP (Waste), 104.4 million Mg of waste were produced in Irkutsk Oblast in 2013. Table 5 illustrates the dynamics of waste production in several hazard classes.

Table 5: Trends in waste production in Irkutsk Oblast in different hazard classes [Mg/a]

| Waste hazard class | 2009 | 2010 | 2011 | 2012 | 2013 |
|--------------------|------------|------------|-------------|-------------|-------------|
| I | 83 | 78 | 91 | 279 | 182 |
| II | 57,599 | 68,378 | 67,111 | 45,060 | 50,134 |
| III | 107,214 | 132,752 | 178,152 | 176,719 | 151,779 |
| IV | 1,590,805 | 1,425,066 | 1,472,496 | 1,460,985 | 1,639,350 |
| V | 61,625,002 | 71,260,436 | 101,200,301 | 116,118,862 | 102,592,259 |
| Total: | 63,380,703 | 72,886,711 | 102,918,151 | 117,801,904 | 104,433,705 |

The number of enterprises that delivered statistical reports on waste management, by year: in 2009 – 727, in 2010 – 687, in 2011 – 704, in 2012 – 812, in 2013 – 1911.

Tables 6-8 illustrate the trends in different types of waste treatment in Irkutsk Oblast over 5 years.

Table 6: Trends in the amount of waste that was treated, recovered or re-used [Mg/a] (including previously accumulated waste)

| Waste hazard class | 2009 | 2010 | 2011 | 2012 | 2013 |
|--------------------|--------|--------|--------|---------|---------|
| I | 216 | 0 | 97 | 417 | 182 |
| II | 82,480 | 67,447 | 67,627 | 57,421 | 56,797 |
| III | 58,587 | 74,928 | 75,190 | 176,998 | 145,236 |

| | | | | | |
|--------|------------|------------|------------|------------|------------|
| IV | 1,369,795 | 1,231,184 | 1,241,696 | 1,389,997 | 1,399,558 |
| V | 35,871,414 | 18,871,529 | 18,924,687 | 57,453,429 | 92,263,691 |
| Total: | 37,382,493 | 20,245,089 | 20,309,297 | 59,078,262 | 93,865,465 |

Table 7: Trends in the amount of temporary stored waste[Mg/a]

| Waste hazard class | 2009 | 2010 | 2011 | 2012 | 2013 |
|--------------------|------------|------------|------------|------------|------------|
| I | 8 | 14 | 14 | 5 | 2 |
| II | 1,600 | 1,942 | 1,946 | 1,505 | 1,446 |
| III | 80,316 | 42,673 | 42,679 | 81,685 | 34,852 |
| IV | 128,622 | 127,963 | 128,177 | 92,050 | 86,714 |
| V | 40,073,799 | 50,410,294 | 50,416,585 | 48,778,920 | 11,866,258 |
| Total: | 40,284,345 | 50,582,886 | 50,589,402 | 48,954,164 | 11,989,272 |

Table 8 – Trends in the amount of disposed waste [Mg/a]

| Waste hazard class | 2009 | 2010 | 2011 | 2012 | 2013 |
|--------------------|-----------|-----------|-----------|-----------|-----------|
| I | 4 | 1 | 1 | 23 | 3 |
| II | 17 | 1,308 | 1,308 | 3,410 | 3,337 |
| III | 7,188 | 6,612 | 6,612 | 5,124 | 5,485 |
| IV | 931,390 | 551,715 | 582,370 | 1,024,735 | 1,028,236 |
| V | 147,915 | 3,344,737 | 4,031,197 | 817,685 | 6,565,069 |
| Total: | 2,418,314 | 3,904,373 | 4,621,488 | 1,850,978 | 7,602,127 |

The following current state of waste management by industry sectors in Irkutsk oblast will be delivered.

Power industry

The main representative of the power industry in the region is **OJSC “Irkutskenergo”**.

During 2012/2013, respectively, 114/113 items of waste of hazard classes I-V were produced in branch units of OJSC “Irkutskenergo”, among them:

- waste of hazard class I – 1 type;
- waste of hazard class II – 1/2 type(s);
- waste of hazard class III – 18/17 types;
- waste of hazard class IV – 34 types;
- waste of hazard class V – 60/59 types.

The total amount of waste produced is 1,944,457.9 Mg in 2012, 1,669,666.266 Mg in 2013, including bottom ash waste from burning coal (1,926,847.8 Mg in 2012 and 1,649,032.9 Mg in 2013).

According to internal technical regulations, in 2013 branch units of OJSC “Irkutskenergo” recovered:

- 302.8 Mg of sewage sludge produced during mechanical and biological waste water treatment;

- 31.9 Mg of oily waste (wiping materials, spent filters, greasy wood dust, pump packing, oil sludge) for energy production;
- 60.6 Mg of waste of hazard class V (unsorted kitchen waste, cuttings of natural clear wood, breakage of roadbed, firebrick grit, cuttings and chippings of clear wood, rubber goods that have lost their consumer properties (conveying belt)) are repurposed for industrial needs, such as watchdogs feeding, restoring road surfaces, quenching the spillage of oil products, thickening the fuel convey systems and vehicle bodies etc.

In 2012 9,695 Mg of wood and hay ash and 3,122.4 Mg of waste fluorogypsum were delivered by third-party organizations and disposed in ash dumps of “TPP-9” and “Ustlim TPP”. In 2013 10,070 Mg of wood ash were disposed in ash dump of “Ustlim TPP”. During 2012/2013, respectively, 857,605/824,413 m³ of bottom ash waste were recovered and 65,489/68,592 Mg of flue ash were sold.

Chemical industry

Chemical industry of the region is represented by the following enterprises: Angarsky electrolytic-chemical plant, Usolyekhimprom, Angarskaya petrochemical company, Sayanskkhimplast, Irkutskkabel, Angarsky polymer factory.

OJSC “Angarskaya petrochemical company”

In 2013 branch units of the company produced 119,710.3 Mg of waste, including:

| | |
|---------------------------|--------------|
| waste of hazard class I | 6.0 Mg; |
| waste of hazard class II | 19.6 Mg; |
| waste of hazard class III | 342,2 Mg; |
| waste of hazard class IV | 28,059.7 Mg; |
| waste of hazard class V | 26,422.6 Mg. |

Thereby 64,860.3 Mg of waste of hazard class IV were produced by dismantling of written-off objects (construction waste from building demolition).

In 2013 19,737.9 Mg of waste were recovered. 44.2 Mg of waste were treated, 75,167.1 Mg were transferred to third-party organizations, and 25,083.9 Mg were disposed on the in-house waste disposal sites.

Waste recovered: spent oils, drained setting of sludge lagoon, ground from excavation works that had not been contaminated with hazardous substances.

Waste transferred to other organizations for recovery: spent batteries, ferrous and non-ferrous scrap metal, spent tires.

Waste transferred to other organizations for treatment: mercury lamps.

Waste transferred to other organizations for disposal: demolition waste.

OJSC “Sayanskkhimplast”

In 2013 the company conducted waste collection, recovery, treatment and disposal for 68 types of waste, including 47 types of waste of hazard classes I-IV. The amount of waste produced in 2013 is 17,672.1 Mg, including 16,522.1 Mg of waste of hazard classes I-IV:

| | |
|----------------------------------|---------|
| waste of hazard class I – 1 type | 3.6 Mg; |
|----------------------------------|---------|

waste of hazard class II – 3 types 9,001.0 Mg;
waste of hazard class III – 19 types 6,153.3 Mg;
waste of hazard class IV – 24 types 1,364.1 Mg;
waste of hazard class V – 21 types 1,149.9 Mg.

1,361.5 Mg of waste were recovered by the enterprise, 5,606.3 Mg of waste were treated, 2,148.7 Mg were transferred to third-party organizations, and 2,148.7 Mg were disposed on landfills.

The company has the following facilities of waste disposal:

- Sludge collector (holding lagoon No 5);
- landfill for vinyl chloride and polyvinylchloride waste disposal;
- landfill for construction and domestic waste (open-pit mine No 3);
- mine drill hole №1;
- open-pit mine No 1 of biological treatment plants;
- open-pit mine No 2 of biological treatment plants;
- holding lagoon No 1 of brine storage.

Part of waste of the company is transferred to third-party organizations.

Pulp and paper industry

Pulp and paper industry of the region is represented by three large enterprises: branch unit of OJSC “Ilim Group” in Bratsk (part of former “Bratsk Timber Mill”), branch unit of OJSC “Ilim Group” in Ust-Ilimsk, “Baikalsky pulp and paper plant”.

Branch unit of OJSC “Ilim” Group in Bratsk

Structural subdivisions of the enterprise produce 67 types of waste, among them:

waste of hazard class I – 1 type, 3.5 Mg/a;
waste of hazard class II – 1 type, 0 Mg/a;
waste of hazard class III – 9 types, 20,031.8 Mg/a;
waste of hazard class IV – 29 types, 507,426.4 Mg/a;
waste of hazard class V – 27 types, 173,208.7 Mg/a.

According to the statistical report of the form 2TP (Waste) for 2013:

- waste produced – 710,670 Mg;
- waste to be disposed – 156,569 Mg;
- waste recovered – 547,619 Mg;
- waste transferred to other organizations for recovery and treatment – 6,482 Mg.

Taking into account third-party organizations, 330,486 Mg of waste were disposed in in-house disposal site, 517,508 Mg of bark and wood waste were recovered in exhaust-heat boilers.

In 2013 91,580,000 RUB were spent on activities that provide environmental protection, in particular, waste management, including:

- failure-free equipment maintenance (sludge collectors);
- transportation and disposal of toxic waste of hazard class I, III;
- acceptance and disposal of industrial waste.

Branch unit of OJSC “Ilim” Group in Ust-Ilimsk

In 2013 the enterprise produced 569,627.9Mg of waste of 49 types, among them:

- waste of hazard class I – 1 type;
- waste of hazard class II – 1 type;
- waste of hazard class III – 3 types;
- waste of hazard class IV – 27 types;
- waste of hazard class V – 17 types.

Waste of hazard classes I and II is transferred to specialized organizations: waste of hazard class I – spent mercury lamps are transferred for treatment; waste of hazard class II – spent lead batteries are transferred for recycling.

Waste of hazard class III – oil and oil-based waste are used as extra fuel and are burnt in heat-producing units of the enterprise when blended with fuel oil (masut).

Waste of hazard classes IV-V are re-used by the enterprise, transferred for recycling to specialized organizations or sent for disposal, depending on the properties of the waste.

In 2013 302,411.7Mg of waste were received from third-party organizations.

OJSC “Baikalsky pulp and paper plant”

The industrial site of the enterprise has the following waste disposal locations:

- a sludge collector, total area size is 118.9 ha;
- a bottom ash waste dump, total area size is 23.6 ha.

Holding lagoon No 12 is used by LLC “Zhilye”, Baikalsk. The shortest distance from the holding lagoon to lake Baikal is 1,350 m.

In 2012 the enterprise produced 73,126.511 Mg of waste, including:

- waste of hazard class I – 0.7Mg;
- waste of hazard class II – 0.3Mg;
- waste of hazard class III – 1.2Mg;
- waste of hazard class IV – 13,130.9Mg;
- waste of hazard class V – 59,993.8Mg.

Waste to treatment – 765.7 Mg.

The amount of waste disposed on in-house sites in 2012 is 55,527.994 Mg of waste of hazard classes IV and V (the majority of which is ash waste from coal burning).

Metallurgical industry

OJSC “Bratsky aluminum plant”

During electrolysis the following types of waste are produced:

- coal froth;
- spent aluminum production anodes containing fluorine salts;
- electrofilter dust;
- waste from overhaul repairs of electrolyzers;
- lining (carbon, fire-proof), scrap metal.

The main type of waste produced by foundry production is slags (waste containing unsorted aluminum).

Waste coming from anode paste production is pitch coke residue and polypropylene waste in a form of a film.

The following types of waste are produced during fluorides production:

- mineral sludge from gas purification of aluminum production;
- flotation tailings of coal froth containing up to 5% of F salts.

In total, in 2013 the enterprise produced 124,875.3Mg of waste, including:

waste of hazard class I – 3.5 Mg;

waste of hazard class III – 48,192.2Mg;

waste of hazard class IV – 53,481.1Mg;

waste of hazard class V – 23,198.5 Mg.

Waste recovered in-house – 30,136.4 Mg.

Waste sent to other organizations – 25,262.1Mg.

Waste disposed in in-house sites – 69,515.04 Mg, including 54,687.4 Mg of waste stored and 14,827.637 Mg of waste disposed.

OJSC “SUAL”, branch unit of “IrkAZ-SUAL”

In 2012 the enterprise produced 97,956.3 Mg of waste:

waste of hazard class I – 1.2 Mg (mercury lamps). The waste is transferred to IE “Mityugin” for recovery.

waste of hazard class III – 31,171.9 Mg (liquid melt of electrolyte). After electrolyte is separated from baked anodes cinder, it is used in aluminum production as raw material;

waste of hazard class III – 14,838.8 Mg;

waste of hazard class IV – 41,014.6 Mg;

waste of hazard class V – 10,929.8 Mg.

Mining industry

Mining industry of the region is represented by such large-scale enterprises, as LLC “Vostsibugol” Company and “Korshunovsky mining and processing complex”.

LLC “Vostsibugol” Company

The total amount of waste produced in 2013 is 1,167,664.8 Mg, which slightly exceeds waste production rates of 2012 (1,158,258.8 Mg). Branch units and subsidiaries of company produced 55 types of waste of hazard classes I-V, including:

waste of hazard class I – 0.4 Mg– 1 type:

- mercury lamps, fluorescent mercuric tubes and rejects;

waste of hazard class II – 18.1Mg– 1 type

- undamaged spent lead batteries, without drained off electrolyte;

waste of hazard class III – 523.6 Mg– 8 types:

- spent oils (engine oils, gear oils, industrial oils, compressor oils, diesel oils, residuum of diesel fuel that had lost its consumer properties) amount 154.4 Mg.
8.8Mg of spent oils were re-used for railroad car treating in winter time or equipment oiling;
- wooden railroad sleeper, impregnated in antiseptics, spent or rejects – 353.6 Mg;
- sludge from cleaning pipelines and tankages from oil and oil products – 7.2 Mg.

waste of hazard class IV – 1,515.0 Mg– 24 types, including bottom ash waste from burning coal in boiler houses:

- 109.7 Mg are packed for storage into spent areas of open-pit mines, for further land re-cultivation;

waste of hazard class V – 1,165,607.7 Mg – 21 types, including:

- waste of mineral origin (coal washing rock) – 631,816.2 Mg;
- waste of mineral origin (coal washing sludge) – 445,795.9 Mg;
- ground coming from stripping works (stripping soils) – 74,056.5 Mg.

Before-mentioned types of waste are packed for storage into spent areas of open-pit mines for further re-cultivation.

- bottom ash waste from burning coal – 11,901.5 Mg; it is used in service roads as a frictional material to fight glaze ice;
- metal waste (ferrous and non-ferrous scrap metal, metal cuttings) – 1,879.9 Mg; it is used to produce repair pieces for mining and processing equipment

Waste that is not used for the needs of the enterprise is transferred to third-party organizations for further treatment.

OJSC “Korshunovsky mining and processing complex”

According to the statistical report of the form 2TP (Waste) for 2013, the enterprise produced the following waste:

waste of hazard class I – 1 type, 0.99 Mg;

waste of hazard class II – 1 type, 0 Mg;

waste of hazard class III – 13 types, 2.7 Mg;

waste of hazard class IV – 22 types, 1,171.2 Mg;

waste of hazard class V – 24 types, 51,325,330.7 Mg.

In total, 51,326,784.7 Mg of 61 types of waste were produced in 2013, as compared to 50,207,688.5Mg produced in 2012.

2 PRIORITY LIST FOR MODULES OF TRAINING COURSE

Formulating a priority list for modules of advanced training courses “Integrated sustainable waste management” forms a theoretical and practical base for further content development for the training courses.

Priority list for training course modules takes into account:

- the information about regional specific features of five branches of industry, provided by four Russian partner universities,
- conducted a workshop “State and problems of industrial waste management in the main industries in Siberian regions and Primorsky Krai” and the feedback received from the Ministry of Natural Resources and Industrial Policy of Zabaykalsky Krai and representatives of industry sectors.

2.1 Priority list following regional specific features

The Republic of Buryatia

1. Mining industry

a. extractive industry

- recovery of rock refuse from tungsten-molybdenum plant
- recovery of rock refuse from mining uranium ores

b. mineral processing industry

- recovery of coal processing waste

2. **Chemical sector** is not represented in the Republic of Buryatia

3. Metallurgical sector

a. ferrous metallurgy

b. non-ferrous metallurgy

- recovery of ferrous and non-ferrous metallurgy waste

4. Timber sector

a. logging industry

b. wood processing industry

- wood waste recovery, storage that prevents material from dusting and inflammation

c. cellulose and paper industry

- recovery of waste and effluents of cellulose and paper industry

5. Housing and municipal services

a. water supply system

- reconstruction and modernization of operating water treatment facilities

Zabaykalskykrai

1. Mining industry

a. extractive industry

- recovery operations for refuse heaps coming from surface mining and underground mining; recycling of associated rock;
- recovery operations for refuse heaps of low grade ore;

b. mineral processing industry

- recovery of tailing dumps with elevated concentration of arsenic, cadmium, zinc, molybdenum;
- treatment of sewage water coming from mining enterprises;
- organization of a system of circulating water supply and water recovery for mining enterprises;
- recovery of coal processing waste.

2. Chemical sector

a. chemical industry

- recovery of pyrite cinders that come from synthesis of sulfuric acid;

b. petrochemical industry is not represented in ZabaykalskyKrai.

Recycling of spent motor oil, its potential refining and re-use are problems relevant for the region, as recovery operations and recycling of rubber items (car tires).

3. Metallurgical sector

a. ferrous metallurgy (not present in the region)

b. non-ferrous metallurgy (not present in the region)

The following is planned as part of the development of these sectors:

- recovery operations of smelter slags (ferrous and non-ferrous metallurgy).

4. Timber sector

a. logging industry

- organization of wood waste storage preventing its dusting;
- organization of wood waste recovery;
- technologies of wood biomass and wood waste recovery; modern equipment in service;
- types of recovered goods – Standard and technical specifications;
- potential markets for recovered goods, rates of capital investment into the organization of production;
- economic measures of wood waste recovery;

b. wood processing industry

- organization of wood waste storage preventing its dusting;
- organization of wood waste recovery.

c. cellulose and paper industry (not present in the region)

The following is planned as part of the development of the industry:

- refining of effluents from cellulose and paper enterprises;
- organization of cellulose and paper waste recycling, recovery of lignin and sludge.

5. Housing and municipal services

a. water supply system

- construction and reconstruction of operating water treatment facilities;
- ways of treating sewage water from housing services and utilities.

b. municipal waste management

- recovery and disposal of bottom ash waste;
- organization of solid domestic waste recovery;
- organization of solid domestic waste sorting;
- organization of solid domestic waste storage that prevents inflammation;
- organization of medical waste recovery;
- recycling of plastic.

Irkutsk Oblast

1. Mining industry

a. extractive industry

- reduce of the risk of inflammation of waste coal;
- waste recovery from mining, stripping soils and mature spent materials from mining iron ore (Korshunovskiy mining and processing plant), coal (Cheremkhovskiy, Mugunskiy, Azeyskiy open-pit coal mines), marble (open-pit mine “Pereval”), salt (Tyretskiy salt mine).

b. mineral processing industry

- recovery of coal washing waste (Kasyanovskaya processing factory);
- recovery of marble dust (open-pit mine “Pereval”);
- improving the effectiveness of re-using aurum mill tailings (“Vysochayshiy”, “Lenzoloto”).

2. Chemical sector

- assuring radiological and environmental safety on the enterprises of radiation hazardous sites (“Angarskiy electrolytic-chemical plant”);
- providing environmentally safe technologies for chemical waste recovering (“Usolyekhimprom”, “Sayanskkhimplast”);
- providing environmentally safe technologies for petrochemical waste recovering (Angarskaya petrochemical company);
- recovery of industrial waste polymers (“Sayanskkhimplast”, “Irkutskkabel”, “Angarskiy polymer factory”);
- reduce of the hazard level of waste that comes from batteries production and treatment.

3. Metallurgical sector

- recovery of aluminum industry waste (Bratsky aluminum factory, Irkutskyauminumfactory);
- recovery of powder metallurgy waste;
- recovery of ferrous and non-ferrous metal scrap; applying technologies of secondary use in core production (Irkutsky heavy engineering factory);
- recovery of liquid waste of electroplating industry (Irkutsky aircraft factory, Irkutsky relay factory).

4. Timber sector

a. logging industry

- recovery of logging waste that takes into account the distance from a given territory to populated areas and traffic arteries (Bratsky timber processing complex, branch unit of OJSC “Ilim” Group)

b. wood processing industry

- wood waste recovery, efficient technologies and legal frameworks for re-using waste in heat and electric energy production, for calculating the amount of energy produced

c. cellulose and paper industry

- recovery and treatment of waste and effluents of cellulose and paper industry;
- re-cultivation of waste storage sites, efficient technologies for treating sludge-lignin.

5. Housing and municipal services

a. municipal waste management:

- In cities and towns
- In areas with small population
- In suburban villages (summer garden communities, cottage settlements etc.)
- In touristic sites, including remote sites and sites located in the territories where economic activity is prohibited

In addition, the Irkutsk oblast proposed to consider the following priorities by developing of courses:

1. Determination of legal restrictions impeding the introduction of efficient system of waste management.
2. Main measures of economic incentive for enterprises that promote efficient waste management systems, including:
 - 2.1. Main measures of economic incentive, defined by current legislation, but not put into practice due to certain reasons; a list of steps (statutory acts etc.) that are required for the practical application of these measures.
 - 2.2. Additional measures of economic incentive that should be adopted by current legislation, and a list of bylaws required for their practical realization.
3. Necessary and sufficient conditions for integrating best available waste management technologies into the business environment (industry-wise).
4. Ways of efficient industrial waste management by enterprise that are located at a distance from waste collection and recovery sites. They require taking into account the geographical factor while designing the waste management system. (Irkutsk Oblast extends 1400 km from north to south and 1500 km from west to east It encompasses a

total area of 7.8 million m², which amounts to 15.0% of Siberian Federal District territories and 4,6% of all territories of Russia.)

5. A system for assessing accumulated environmental damage due to past business operations and other activities; technologies for recovery and treatment of accumulated waste that take into account how its properties and composition have changed during the time of storage.
6. Practical experience in environmental impact assessment of waste.
7. Inclusion of waste impact in the process of designing civil and industrial sites. Modern information technologies for calculating waste production volumes and their impact on the environment and on human.
8. Similarities and differences in environmental impact assessment of waste on the environment (hazardous waste) and on human (toxic waste).

2.2 Additional priority list, based on the outcomes of the conducted workshop in Chita

Additional priority list for modules of the advanced training course, based on the outcomes of the conducted workshop in Chita and the feedback received from industry representatives.

1. Mining industry

- Technologies for mill tailing recovery (in paste form, with high concentration of salts of heavy metals, e. g., cadmium, copper, cyanides)
- Methods of industrial contaminated site treatment (refuse heaps and disposal sites contain lead, arsenic, cadmium, cyanides, gold and silver)
- Recovery technologies for cyanide barrels
- Treatment technologies of mercury, mercury-quartz or fluorescent lamps, spent lead batteries, with electrolyte; mineral oils waste; wiping materials contaminated with oil and oil products (level of oil or oil products in the material being at least 15%); spent filters for purifying vehicle oil; vehicle filter waste (spent air filters)
- Recovery technologies for sludge from cleaning pipelines and oil and oil products containers
- Recovery technologies for wood cuttings and chippings contaminated with oil and oil products (level of oil or oil products in the material being at least 15%)
- Recovery technologies for bulk waste from mining works
- Stabilized sludge from biological treatment plants for service-utility and combined sewage water
- Grab iron and waste from clean unsorted ferrous metals in a form of pieces and items
- Clean grab iron and waste from steel articles
- Waste from mining ore and sand of precious metals (gold, silver, platinum group metals (mill tailings))
- Rocky siliceous stripping soils (virtually non-hazardous)
- Coal burning ashes

2. Chemical sector

- Methods and technologies contaminated site treatment, including mercuric waste (manufacturing buildings, sludge collectors, contaminated soils, water-bearing strata)

- Treatment methods and technologies for volatile organic components
- Treatment technologies for banned organochloride toxic chemicals
- Know-hows in underground disposal of liquid highly hazardous waste of chlorinated organics that comes from vinyl chloride production

3. Metallurgical sector

- Know-hows in sludge collector construction (EU standards)
- Know-hows in gallium extraction from metallurgical sludges
- Know-hows in fluorides utilization and extraction
- Know-hows in extracting rare-earth metals from technogenicraw materials

4. Timber sector

The test region is rich in primary wood and is characterized by large distances between populated areas and logging sites. Thus, the following is required:

- Recovery technologies for cuttings, bark, slabwood, battens, chippings, wood dust, of high payback speed
- Technologies for treatment of phenol-carbamide glue, formaldehydes, acetones, enamel, dissolvents (by-products offurniture production from wood)
- Mechanical and chemical-mechanical wood processing should be preferred over other types of processing that involve low use of chemicals.

5. Housing and municipal services

- Municipal-level programs of waste management
- Solid domestic waste sorting
- Recycling of valuables of solid domestic waste
- Recovery of toxic waste in solid domestic waste (mercury lamps)
- Best practices of waste sorting in higher educational institutes (“Green universities” movement)
- Development of general recommendations for municipal districts responsible for primary collection and disposal of solid domestic waste (in particular, a methodology to calculate annual environmental damage)
- Low-price technologies and methods contaminated site treatment

3 PRIORITIES OF SERVICES OF BAIKAL WASTE MANAGEMENT IN IRKUTSK

Defining future services of eco-centre “Baikal Waste Management” is one of the sustainability blocks of the Tempus project, since it serves the basis for the eco-center's business plan (WP №8) and it sets short-term and long-term goals for strategic partnership between ISTU, universities-members of the project, industry and executive authorities of the test region.

Based on the suggestions of 4 partner universities (ESSUTM, FEFU, STU and ISTU), a list of possible services of the eco-center “Baikal Waste Management” was finalized during the first seminar in STU.

“Baikal Waste Management” is planning to provide the following services and activities on waste management:

Engineering, environmental and project inquiries:

- create passport waste for waste hazard classes I-IV, calculation of hazard classes for the environment;
- develop process procedure for waste management;
- develop “waste production and disposal limits project”;
- develop and support byprepare of the annual environmental statistical reports 2TP (Waste);
- calculate charges for negative impact on the environment for small and medium-size enterprises;
- develop project documentation for contaminated site treatment;
- prepare project in waste management (preparation of investment offers, business plans; fund-raising);
- develop and implement federal and regional projects in waste management.

Lab services:

- conduct physical-chemical analysis, measuring, other types of quality control of raw material and waste;
- verify the assignment of waste to hazard class V via biotesting;
- define fractional and morphological composition of waste.

Consulting:

- offer consultations on waste management in different industrial sectors and using different types of waste;
- offer consultations on legal frameworks in waste management;
- offer consultations on the choice of modern equipment for waste recycling, recovery, treatment and disposal;
- provide methodological assistance in licensing in the area of waste management;
- provide information-analytic assistance in activities related to the area of waste management;
- systematise the waste data in the region, assess the compliance of technologies in service with BAT (best available technology);

- environmental audit;
- environmental expert analysis of projects in the area of waste management.

Educational services:

- organise personnel training, retraining and advanced training in waste management;
- organise conferences, seminars, trainings, round tables in the area of waste management;
- systematise educational programs in the area of waste management;
- create methodological guidelines for educational programs in the area of waste management;
- organise internships on waste management, including international ones.