

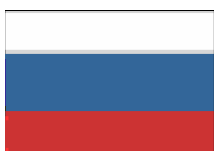


„INTEGRATED SUSTAINABLE WASTE MANAGEMENT“ FOR SIBERIAN COMPANIES AND AUTHORITIES



*EUROPEAN EDUCATIONAL COOPERATION PROJECT
WITHIN THE PROGRAM **TEMPUS IV***

with the participation of Russia, Germany, Austria, Denmark, and Greece



REPORT WORKPACKAGE NO. 6 ”TEST RUNS OF TRAINING COURSE”

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TEMPUS IV is a programme supported by the European Union. It is aimed to encourage the modernization processes in the higher education of the partner countries of the Eastern Europe, Central Asia, Western Balkans and the Mediterranean region mainly through inter-university cooperation projects. The main goal of the programme is to widen the cooperation in the higher education between the European Union and the partner countries in the context of the realization of the Lisbon Strategy and the Bologna Process. Besides the improvement of the cooperation at the level of educational institutions, TEMPUS contributes to establishing and developing the interpersonal communication.

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1. DESCRIPTION OF WORKPACKAGE NO. 6



WORKPACKAGE NO. 6: TEST RUNS OF TRAINING COURSE

Duration: 20-25 months

Related assumptions and risks

- Lack of course participants (employees of companies) due to management of companies (no individual exception, arising expenses, etc.),
- Risk of appointments regarding travel arrangements (applying for visa etc.),
- loss of employees (illness, change of occupation),
- lack of support of companies to produce the educational film (banning of filming at companies, that host the excursions)

Description of workpackage

The first test run of the training course takes place in the months 20 - 21. It is conducted with selected, responsible employees of Russian companies of concerned industry sectors, which were identified in 2.1. Selected participants directly work with waste, are responsible for waste management or various activities regarding waste disposal. Lecturers are employees of involved Russian and European universities.

The average size of a class is accounted with 15 participants of each Russian University. Moreover, the training course is planned to last 72 hours (about 1.5 weeks, 64 hours of theory and 8 hours practical excursion) to ensure an intense training. The course takes place in parallel at all four participating universities in Russia (ISTU, ESSUTM, TSU and FEFU). It implies a total number of participants of about 50 people. The Baikal Wasma Centre (ISTU) is venue of the training course. Given lectures are simultaneously transferred to other universities using a video conference. Based on great distances between Siberian Universities, video conferences are essential to avoid long and expensive travels and to encourage as much as possible participants to join the training course. Hence, equipment needs to be purchased in advance. During a field trip (month 22) employees of universities and authorities and a maximum of 15 participants from different Russian regions (Irkutsk, Ulan-Ude, Tschita, Vladivostok) (first test run of the training course) visit European companies that already set up innovative waste management and environmental management systems.

The first test run is evaluated and reviewed after finishing it (WP7). Content and the scope are reviewed, whereas results are used to optimize the second test run (takes place in month 24-25).

Moreover, an exchange of experiences between Russian and European authorities regarding incentive systems is planned. The field trip is connected to the coordination meeting 3 in Dresden (month 22).

ACTIVITIES OF WORKPACKAGE NO. 6

6.1. First test run of training course

- The practical experience of lecturers regarding the first test run are surveyed.

- Establishing of practical experiences of lecturers, participants of the first test run, employees of authorities based on the excursion and contact to environmentally friendly companies and authorities in Europe.

6.2. Second test run of training course

- Based on the first test run an optimized second test run is accomplished to further examine the practical experience of lecturers
(In contrast to first test run, only one person of ESSUTM, TSU, FEFU travel to ISTU, which is based on (already) high travel costs as distances between universities add up to 2000 - 5000 km)

6.3. Excursion and practical exchange of experiences

- Excursion is organized to European companies that already set up innovative waste management and environmental management systems.
- participants are employees of companies and authorities (maximum of 15 participants from region of Irkutsk with an area of 3xFrance)/ISTU organizes/pays for participants
- Establishing of an educational film during excursion to give future participants additional information about European examples, as no further excursion to Europe is financially possible

Lead partner ISTU, (TU Irkutsk), RF

Tab: 6.1. Role and tasks in the workpackage

Role and tasks in the workpackage	Partner	Number of staff days
- Coordination of work package - Organization and giving of first two test runs and video conference (lessons) - Development and participation at excursion	ISTU TU Irkutsk	86
- Organization and giving of first two test runs - Organization of coordination meeting 3 in Dresden - Development and participation at excursion	TUD	58
- Organization and giving of first two test runs - Development of excursion	BOKU	21
- Organization and giving of first two test runs	DTU	16
- Organization and giving of first two test runs	TUC	16
- Organization and implementation of the first two training courses and participation at video conference (lessons) - Participation at excursion	ESSUTM FEFU STU	25 25 25
- Participation at the first two test runs and excursion (No staff costs are accounted for Russian authorities, as the law of corruption prohibits the payment of Russian employees of authorities by funds of the EU)	MNREI MNR RB AI	20 20 20

Equipment

Equipment of the auditorium and procurement of technical equipment to perform video conferences at four involved Russian universities (ISTU, ESSUTM, TSU and FEFU). Higher Equipment costs occur for ISTU because it is venue of the training course. It implies a need for high quality equipment to ensure an adequate sound and picture that is transferred to other participating universities ESSUTM, TSU, FEFU.

Equipment includes: PCs, main monitor, screens, socket outlets, speakers, microphones with receiver, mixing consoles, projectors, projector screen walls, camera with integrated noise-cancelling and tripod, webcams, several types of cables

Other costs

- Translator for first two test runs (guaranteeing accurate communication)
- Translator for excursion and coordination meeting 3 (guaranteeing accurate communication)
- Development of educational film (documentation of best - practice examples at excursion in Europe)

2. RESULTS OF THE PERFORMED ACTIVITIES OF WORKPACKAGE NO. 6

6.1. FIRST TEST RUN OF TRAINING COURSE

The first distance test run of training course “**Integrated Sustainable Waste Management: Housing and Communal Services**” was held on September 14–16, 2015 in the Far Eastern Federal University (FEFU, Vladivostok) and simultaneously broadcast in 3 Russian partner universities of the project: INRTU (Irkutsk), ESSUTM (Ulan-Ude), TbSU (Tschita).

The improvement of the role of Russian federal and national universities in the professional development of waste management specialists for industrial sectors of the Baikal region and the Primorskii krai is the main goal of the TIWaSiC project.

The first distance test run of training course “**Integrated Sustainable Waste Management**” was developed and tested by the consortium of the TIWASiC project since 2014. During 3 days, the remote course united more than **90 participants** within a distance of 4000 km. The participants of the courses improved their knowledge in the sphere of sustainable municipal waste management and best available techniques.

The aim of the course was the advanced training for managers and waste management personnel of an enterprises by creating a system of theoretical knowledge and practical skills in the sphere of waste management based on the comparison of the Russian and the European waste management systems at communal services.

The advanced training at FEFU was performed by the leading professors and scientists from European partner universities.

The European partners are represented by Professor Thomas Christensen (Head of Environmental Engineering Department, Technical University of Copenhagen, Denmark); Professor Christina Dornack (Director of the Waste Management Institute, Technical University of Dresden, Germany), Dr. Christoph Wuensch, (Head of TIWaSiC

project, Doctor of the Waste Management Institute, Technical University of Dresden, Germany), Olga Chernova (Researcher of the Waste Management Institute, Technical University of Dresden, Germany), Professor Stefan Salhofer (Vice-Head of the Waste Processing Department, Agricultural University of Vienna, Austria), Jochen Ebbing (board member of EURORUSS, Researcher of Iserlohn Institute for the recycling of waste, Germany), Professor Evangelos Gidakos (Head of Laboratory of particularly dangerous and toxic waste of the Hazardous Waste Treatment Department, Polytechnic University, Chania, Crete, Greece).

The Russian lecturers were Associate Professor Olga Ulanova, Coordinator of TIWaSiC project (Irkutsk National Research Technical University (INRTU), Irkutsk); Professor Elena Zelinskaya (INRTU); Associate Professor Vlada Starostina (INRTU); Head of the Scientific Center Natalia Tolmacheva (INRTU); Associate Professor Natalia Alberg (East-Siberian State University of Technology and Management (ESSUTM), Ulan-Ude); Associate Professor Konstantin Razmakhnin (STU)

During the whole course, the video communication was supported between all the Russian partner universities. The participants of the course from Irkutsk, Tschita, and Ulan-Ude could ask questions to lecturers after each lecture. In addition, the feedback with the participants was organized in the form of a survey. **During 3 days, twelve expert lecturers gave 18 lectures for the participants of the course.**

The main issues discussed were the basic terms of the waste management system and the changes in the legislation and the current significant reorganization in the municipal waste management.

Within the project, this course was a test aimed to test the structure of the course, the main thematic sections, and the learning technologies. The survey for the participants after the course was aimed to reveal the positive and the negative points both in the content of the course and the teaching methods.

All the participants were given the certificates for professional development.

See the advertisement of the course in Appendix.

6.2 SECOND TEST RUN OF TRAINING COURSE

The second distance test run of training course “Integrated Sustainable Waste Management: Industry and Municipal Service” was held in the INRTU technopark within the TEMPUS project TIWaSiC on April 4–8, 2016.

The 5-day training course took place simultaneously in 4 partner universities: ESSUTM (Ulan-Ude), TbSU (Tschita) and FEFU (Vladivostok) using the distance learning technologies.

The advanced training in FEFU was performed by the leading professors and scientists from the European partner universities.

The European partners are represented by Professor Thomas Christensen (Head of Environmental Engineering Department, Technical University of Copenhagen, Denmark); Professor Christina Dornack (Director of the Waste Management Institute, Technical University of Dresden, Germany), Dr. Christoph Wunsch, (Head of TIWaSiC project, Doctor of the Waste Management Institute, Technical University of Dresden, Germany), Olga Chernova (Researcher of the Waste Management Institute, Technical University of Dresden, Germany), Professor Stefan Salhofer (Vice-Head of the Waste Processing Department, Agricultural University of Vienna, Austria), Jochen Ebbing (board member of EURORUSS, Researcher of Iserlohn Institute for the recycling of waste, Germany)

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During one week, the representatives of five economic sectors (mining industry, chemistry, metallurgy, wood industry, and housing and communal services) passed through the advanced training in the sphere of integrated sustainable waste management. The courses were the main target of the project.

The second course was prepared with consideration of the results of the first test run of training course (the survey among the participants) and the additional recommendations of the external monitoring of the project by EACEA (Brussels) in June 2015. The second course on the integrated sustainable waste management covered five leading industries, which were specified at the first seminar in Tschita. This significantly increased the interest of enterprises and authorities for the advanced course. The training course was arranged as follows: the first 1.5 days were devoted to the general issues in the sphere of production and consumption waste management; the lectures on the other days were focused on specific industrial sectors, particularly, on the best available techniques. During five days, 26 lectures were given.

The main issues considered the legislative and economic aspects of the waste management in the European Union and in Russia, the classification of waste, and the limits. Other important issues were the problems and prospects of the implementation of best available techniques in the logistics, storage, landfilling, and material, fuel, and mechanical-biological processing and treatment of waste. The training program included the environmental management, programs and concepts of industrial waste management, the material flow analysis, and the life cycle assessment.

The distinctive features of the course was the presentation of specific technologies developed in the participant universities of the project: the utilization of polymer waste, wastes from the oil refinery and coal chemistry, the waste prevention technologies in the municipal sphere as well as in wood processing, mining, metallurgy, and chemistry.

Finally, the another survey was conducted, and the participants were given the certificates. The telecommunication provided the interactive mode of the educational process, which was actively used by the participants at all the classes.

6.3. EXCURSION TO GERMANY AND PRACTICAL EXCHANGE OF EXPERIENCES

On December 7–11, 2015, the traineeship of the lecturers and the regional representatives of waste management enterprises to the enterprises of Germany was held in Dresden. The one-week traineeship was organized by the partners from the Technical University of Dresden under the leadership of Dr. Ch. Wunsch.

The excursions and workshops were organized to present the German industry and waste utilization enterprises and to enhance and intensify the contacts between the partners of the TIWaSiC project, the regional enterprises, and the European companies. These events contributed to the activization of new environmental reforms and to the united efforts of environmentally oriented enterprises for the formation of waste processing industry in the model region.

The trip helped the Russian participants to know better new approaches of German companies to the management of municipal, hazardous, and industrial waste, to study the approaches to the implementation of the environmental management in different industries, and to observe the state-of-the-art waste management tools function practically in the following industries:

1. Mining
2. Pulp-and-paper
3. Fuel industry
4. Housing and communal services (solid municipal waste management)

In addition, the Russian delegation (35 people) visited the **German Federal Environment Agency (UBA) in Dessau**, where the seminar on the extended liability of producers and the development of the BREFs for waste management enterprises was organized.

Documentary educational movie

The efficiency of the education depends not only on the content of the training materials but also on the methods of information delivery. One of the most efficient tools is an educational movie. Such a movie was shot within the TIWaSiC project to be used as a visual learning material during the advanced training on the integrated sustainable waste management. The target group for the developed courses are workers of industrial enterprises and authorities of Siberia and the Primorskii krai.

For the Russian delegation consisting of representatives of industrial enterprises and scientists of the universities of the model region, the tours to different industrial enterprises in Germany were organized on December 7–10, 2015. During the tours, the participants were accompanied by the camera crew. The video materials from the tours were used in the documentary educational movie **“Waste management in Germany”**. The scientific video story lasting for 40 min combines the selection of the impressions of

the four-day tour and a presentation of the state-of-the-art waste processing technologies in Germany.

The beginning of the tours and, thus, the beginning of the movie was the visit to the paper mill in Kriebstein, which produces high-quality printing paper based only on wastepaper.

The wastepaper processing, in turn, generates waste whose utilization is now rather expensive for the firm. The movie tells about the solution found by the company, which is to be implemented in the nearest future.

An urgent problem in Russia is the processing of spent fluorescent lamps, thus, the Russian delegation visited the Larec GmbH enterprise in Brand-Erbisdorf, where 2,000 tons of lamps per year are processed.

After that, a spectacular can see functioning of a plant for the mechanical and biological waste treatment located near the Leipzig city built in 2005 because of the implementation of the ban for landfilling untreated waste in Germany. Nearby, there is a landfill for stabilized waste put in operation in 1995 at the place of a former abandoned brown coal mine. It is noteworthy that a former industrial region is now turned into a touristic one. On the banks of mining lakes, there are beaches, cafes, and the infrastructures for water sports. Despite the vicinity of a landfill with a touristic zone, the environmental situation on the territory is carefully monitored. The landfill has wastewater treatment plants for neutralizing the drainage water and a plant for the landfill gas utilization, which is described in detail in the movie.

The final part of the movie shows the waste incineration plant in Lauth. It is described how the thermal processing process of the residual fraction of waste is performed and, more important, how toxic gases released at the incineration are treated by the multi-stage purification system.

The movie gives a visual representation of the importance of the properly organized waste management at German enterprises and shows the municipal waste processing techniques realized in Germany and the arrangement of an environmentally safe waste landfill at a high technical level.

3. EFFICIENCY ANALYSIS OF THE DISTANCE COURSES

In September 2015, the advanced training course “Integrated Sustainable Waste Management: Housing and Communal Services” was held at FEFU using the distance learning technologies. Simultaneously, the course was broadcast through the telecommunication system to 3 Russian partner universities (INRTU, ESSUTM, and TbSU).

After the course, the participants were offered a survey aimed to reveal their level of satisfaction according to the following criteria:

- quality of acquired knowledge;
- level of formation of acquired competences;
- schedule;

- atmosphere in the process of learning.

In addition, the participants were asked about their willingness or unwillingness to repeat the learning experience using the distance learning technologies. The questions in the survey were formulated the way so that the participants could both choose the answers among the proposed ones and to express their opinion in free form. More than 70 % of the participants took part in the survey.

On a whole, the result of the survey is the positive evaluation of the course from the point of view of both the informational content and the presentation of the material.

As for the recommendations of the participants, it was noted that it would be useful to give more region-specific practical examples, to provide the information about the processing of waste from the mining industry, to discuss a wider range of environmental problems, and perform more detailed analysis of issues related to the legislative aspects. Another wish was the organization of such a course in the European countries with the simultaneous visits to waste processing enterprises.

With varying degrees of certainty, all the participants expressed their willingness to study remotely in the future, which, on a whole, can be interpreted as the success of the course, particularly, with consideration of significant distances between enterprises and educational centers. The telecommunication made it possible to organize the interactive educational process, which was actively used by the participants at all the classes. Thus, this form combines the advantages of the live communication with a lecturer and the distance learning technologies and to significantly widen the geography of participants and to increase the availability of the course.

All the notes, recommendations, and wishes were considered by the developers of the course and integrated in the second advanced training course, which were held in April 2015 at INRTU.

The subject matter of the second course on the integrated sustainable waste management was significantly widened and covered five leading economic sectors: mining industry, chemistry, metallurgy, wood industry, and housing and communal services. This significantly increased the interest to the course for enterprises and authorities. As a result of the survey, the content of the educational materials was also optimized. More time was devoted to such issues as the specific waste management technologies, their practical implementation conditions, and the analysis of the environmental and economic efficiency of their implementation at enterprises.

As a conclusion of the two distance courses, it should be emphasized that almost all the target groups were interested in the advanced training courses. The audience of the first and the second courses was distributed as follows (Fig. 1).

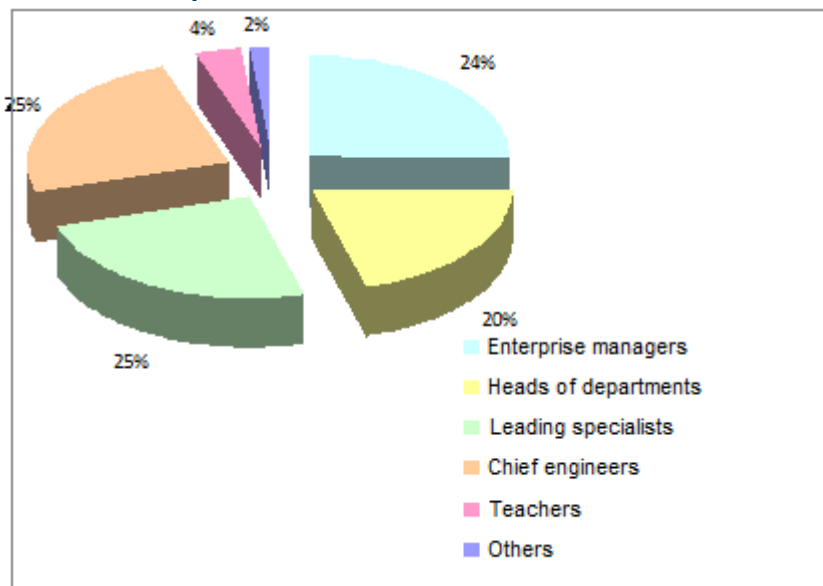


Fig. 1. The ratio between the number of representatives of different target groups

The percent fractions of managers of enterprises, leading specialists, chief engineers were almost equal (24-25%). Thus, the representatives of these target groups feel the need in improving their competence in the sphere of integrated waste management, regardless of their position at an enterprise. Heads of departments accounted for 20%; 4% were lecturers, and 2% were other groups. It is important that almost each target group included both representatives of industrial enterprises (large, medium, and small business) and workers of project and research organizations and authorities. Hence, the courses are relevant for almost all the groups dealing with the waste management process: from the regional authorities to firms directly implementing the waste utilization technologies. It was the main goal of the project to organize the knowledge transfer system for representatives of all levels of the waste management process; from this point of view, the efficiency of the test runs of courses is evident.

As for the common contribution of the organizers (universities) of the distance courses, it is noteworthy that the largest number of participants were from Vladivostok (37%) at the first course and from Irkutsk (38%) at second advanced training course. The test run of training courses were held in these cities and broadcast to the partner cities, where the participants could also attend the full-time course. The organizers of the course in the Trans-Baikal region noted the stable interest of the representatives of the industry to the distance courses because it was emphasized that that was an opportunity of internships, visits to enterprises, and the experience exchange.

As expected, the first and second test run of training course was attended by on average 15 to 25 people in each of the partner universities. The analysis showed that the regions where all the industries concerned in the program of the courses (the Primorskii krai and the Irkutsk region) were represented by a large number of participants. As a result, in total, the courses were attended by 191 participants, including 60 people from Irkutsk, 58 from Vladivostok, 44 from Tschita, and 29 from Ulan-Ude. In Fig. 2, there is the percentage ratio of the contributions of the Russian partner universities into the total number of participants.

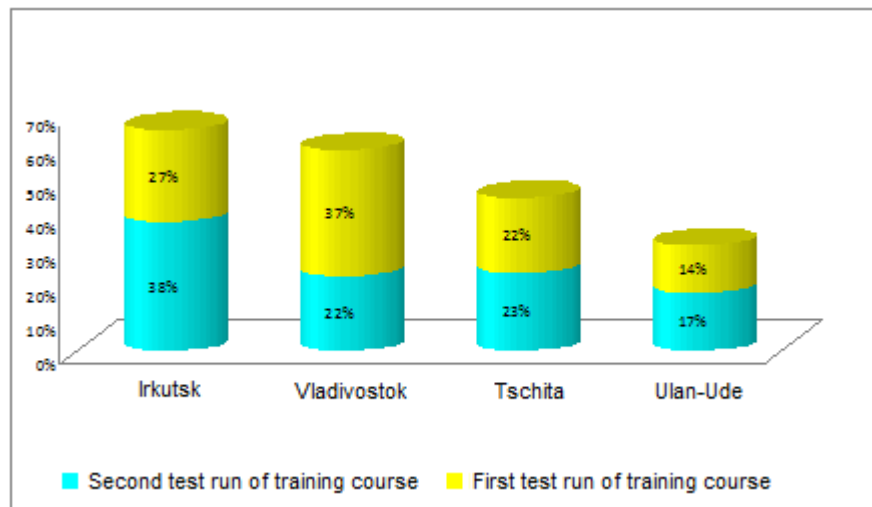


Fig. 2. The ratio between the numbers of participants from the partner cities

The participants of the first test run of training course were officially certified by the certificates for professional development; after the second course, the participants were given the certificates for advanced training. The information on the distribution of the issued documents at the partner cities of the project is presented in Fig. 3.

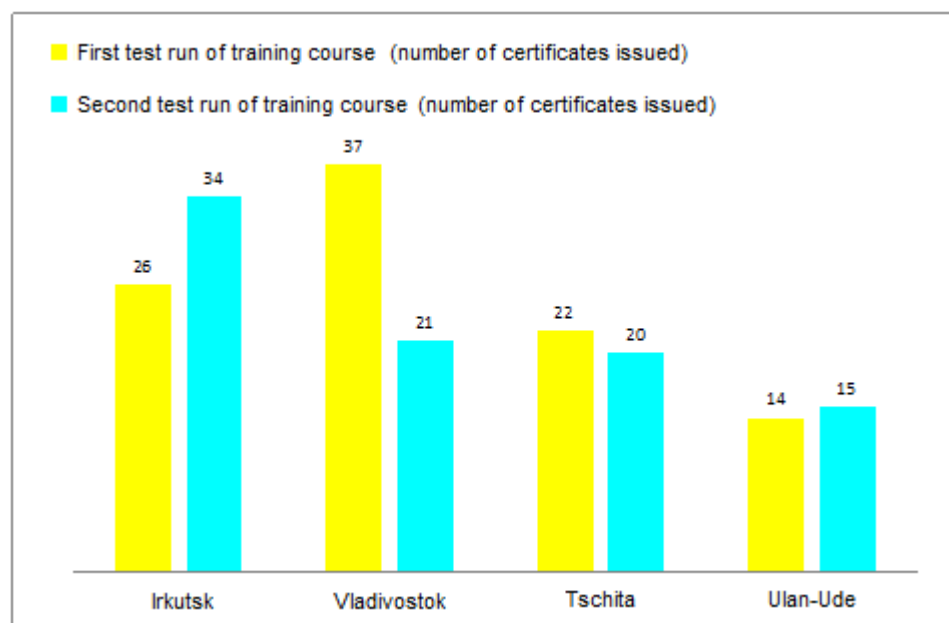


Fig. 3. The number of certificates issued at the distance advanced training courses

On the whole, the analysis of the course showed high interest of participants. It revealed the ways to improve the structure of the program and to determine the priority trends in the themes discussed. As a result, the course that covers all the main issues concerning the sphere of waste management was developed. According to the

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participants, the course has a problematic nature and helps to follow the changes regarding both the legislative level and the specific waste management techniques.