



**018530 - SWITCH**

## **Sustainable Water Management in the City of the Future**

Integrated Project  
Global Change and Ecosystems

### **Progress report D5.3-13a** Ner River Project, Willow Plantation Lodz

Due date of deliverable: M23  
Actual submission date: M23

Start date of project: 1 February 2006

Duration: 60 months

Organisation name of lead contractor for this deliverable: University of Lodz

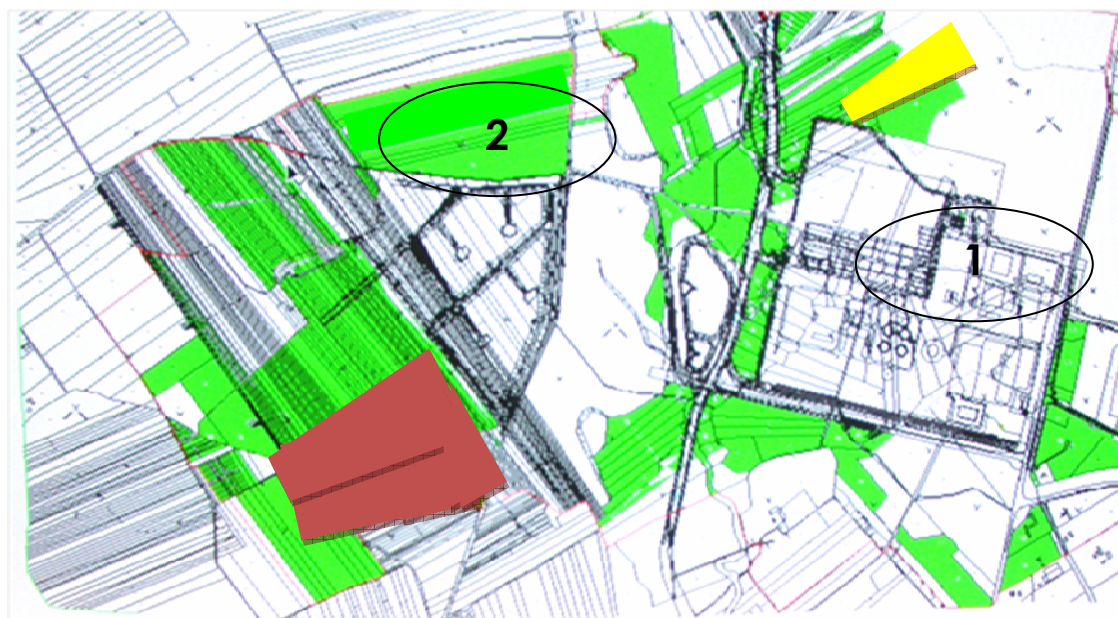
draft

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
<b>PU</b>	Public	
<b>PP</b>	Restricted to other programme participants (including the Commission Services)	X
<b>RE</b>	Restricted to a group specified by the consortium (including the Commission Services)	
<b>CO</b>	Confidential, only for members of the consortium (including the Commission Services)	

**DEMONSTRATION & IMPLEMENTATION****Lodz, M: 13-24****Establishment of new areas and exploitation of the existing plots  
of the experimental willow plantation  
in the protective zone of the Waste Water Treatment Plant  
(The Ner river Project)****1. Introduction**

The general aim of the implementation in the protective zone of the Waste Water Treatment Plant (WWTP, Fig. 1) is to show the alternative ways of the sewage treatment plant management in urban areas – closing the cycles of nutrients and pollutants by sewage sludge utilization on an experimental energetic willows plantation and their conversion into biomass and bioenergy by application of ecohydrology and phytotechnology.

The activities in 2007 were: 1) Establishment of new areas for willow plantations, 2) Continuation of the existing plantation exploitation, 3) Continuation of the monitoring programme, 4) Testing and demonstration of stabilized sewage sludge application for deciduous ornamental shrub production, and 5) Development of the first version of the Decision Support System mathematical model based on the literature review and the obtained results.



*Figure 1: Location of willow plantation (authors: The City of Lodz Office): 1 – Main building of Water Treatment Plant; 2 – Experimental willow plantation. Red patch: the area of willow production and exploitation; Yellow patch: area of new planting*

## 2. Implementation activities

### 2.1. Biomass production and yielding

The biomass produced on the plantation has been harvested on the total area of 22,2557 ha, in January 2007 (Fig. 2), and the third additional area in December 2007, by the City of Lodz Office.

The willow was cut from plots of the plantation different age (sequential cutting):

- Area 1: sanitary cutting after the first year of growth (first year of the operation);
- Area 2: two-year old willow (second year of the operation);
- Area 3: two-year old willow (third year of the operation).

The obtained total and per hectare of the biomass is presented on the Figure 3, and achieved the following values:

	Surface area	Biomass per ha	Total biomass
Area 1:	6,0374 ha	0,37 t/ha	2,3 t
Area 2:	16,2193 ha	3,79 t/ha	61,5 t
Area 3:	12 ha	12,7 t/ha	152,0 t

### 2.1. Biomass production

Planting of the new willow plots on the additional area of 3 ha (Fig. 1) was conducted in May 2007. The size of this area results from the possibilities of land purchase by the City of Lodz Office.



Figure 2 Willows cutting

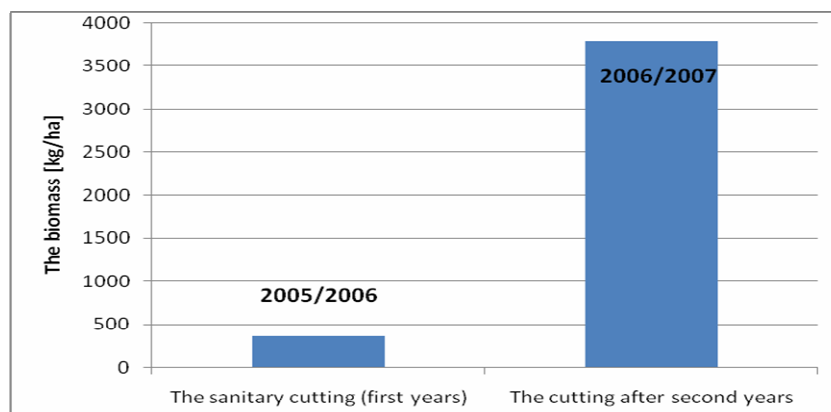


Figure 3 Increase of the willow biomass after second year of planting

## 2. New implementations: sewage sludge use for decorative shrub production

In May 2007, the new experiment started on the use of stabilized sewage sludge for deciduous decorative shrubs production (Fig 4). The results were presented in the report: of the Lodz Working Group V by Romanowska-Duda and Grzesik: “Use of stabilized sewage sludge in the deciduous ornamental shrub production” (full report available in the RTD section).

## 3. Follow-up on other activities specified in the first year report (summary report)

The activities reported in this section relate to the goals specified in the progress report in 2006, as the next step activities:

### 3.1. Estimation of the toxicity of soil after sewage sludge application in environmental and experimental conditions;

The aim of this study was to assess the soil toxicity after the sewage sludge application to assess the optimal doses. For the study, a series of three microbiotests was used: primary producers (higher plants seeds: *Sorghum saccharatum*, *Lepidium sativum* oraz *Sinapis alba*), primary consumers (*Heterocypris incongruens* (Ostracodtoxkit), and decomposers (bacteria: *Vibrio fischeri* (Microtox® STP)). The results show, that plantation fertilizing with the sewage sludge and compost mixture produces less toxic effect on the soil than using sewage sludge only. It also creates better conditions for the willow growth, resulting with higher biomass production, related to higher amount of nutrients.

### 3.2. Estimation of the efficiency of rhizosphere absorption

The goal of the study was to calculate the efficiency of heavy metals and nutrients assimilation by the root zone of willow, by using rhizotron, rhizobox methods. The figure 4 shows the rhizoboxes used for the experimental work. The first year results are now under statistical analysis. The results are under statistical analysis.



*Figure 4. Start of the experiment to estimation of the efficiency of absorbing the elements in the rhizospheres*

### ***3.3. Development of the mathematical model for efficiency of the plantation in biomass production and heavy metals remediation***

A conceptual mathematical model has been developed in Stella 9.0. The model will be under calibration and validation process in the coming years of the project, based on the field results. The detailed report from this activity is provided in a separate report of the Lodz Working Group V by A. Drobniowska: "The conceptual mathematical model for the sewage sludge management and biomass production in the Waste Water Treatment Plant";