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# Assessment of bioremediation potential for the soil contaminated with nitroaromatic compounds

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## Outline:

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- 1. The main results obtained in 2004-2006.**
- 2. The objectives and deliverables for the current project (2009-2010).**

# 1. The main results obtained in 2004-2006.

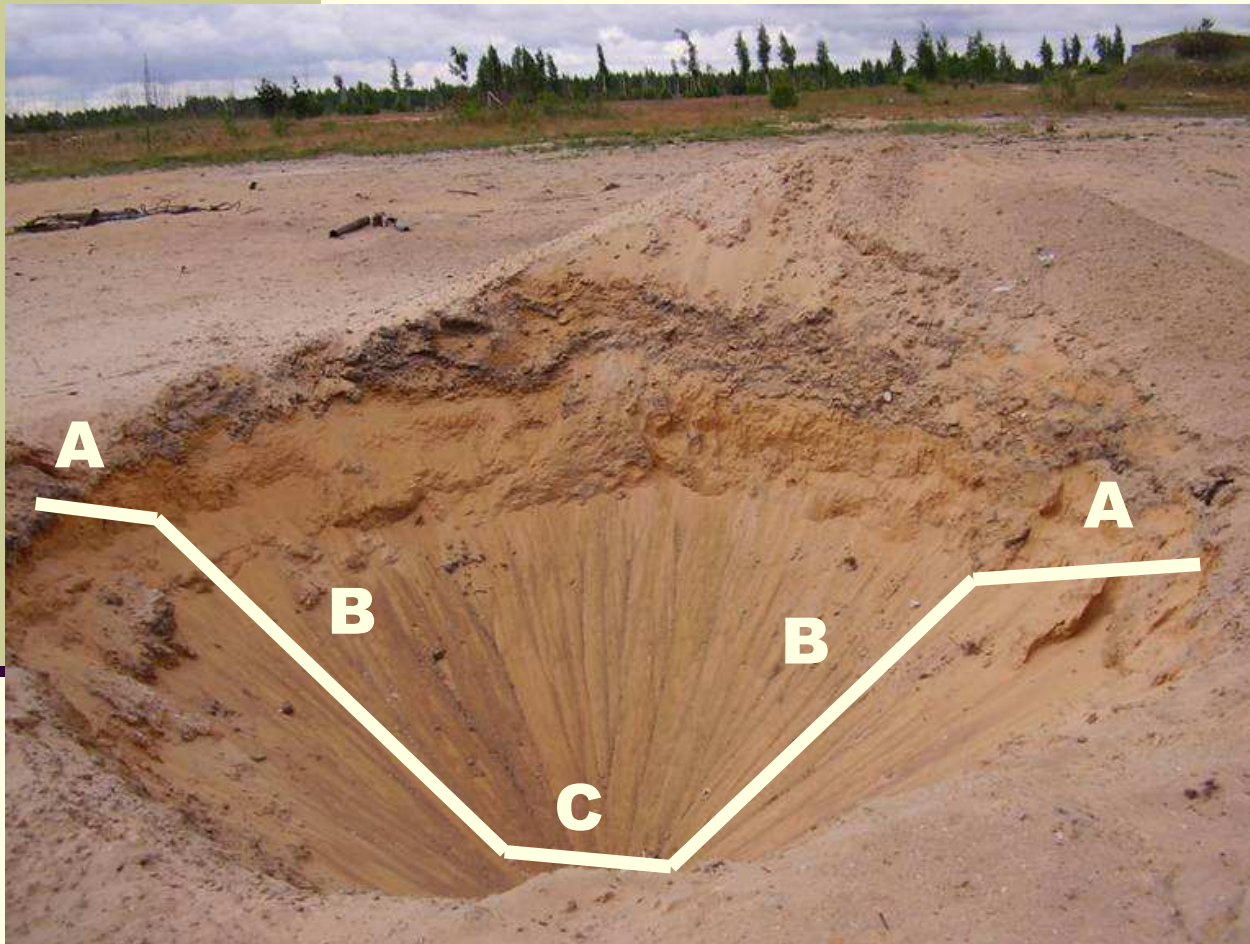
## Field inspection and sampling at Adazhi military camp



Soil samples, collected from different sites, were tested for the presence of explosives using mobile laboratory. Some of them were taken for further research.

# 1. The main results obtained in 2004-2006.

## Field inspection and sampling at Adazhi military camp



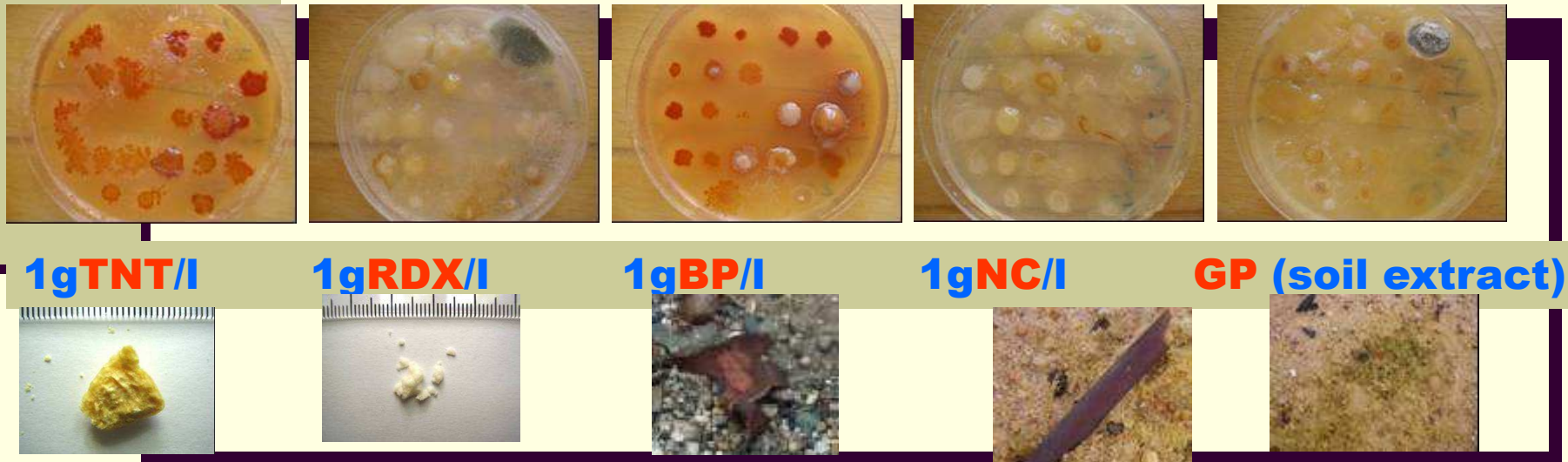
**Distribution of residual explosives in the demolition site.**

**Samples A, B, C were taken from the upper, middle and bottom parts of the site, resp.**

# 1. The main results obtained in 2004-2006.

Laboratory testing of the microorganisms isolated from soils contaminated with explosives

Selection of the "BEST" isolates

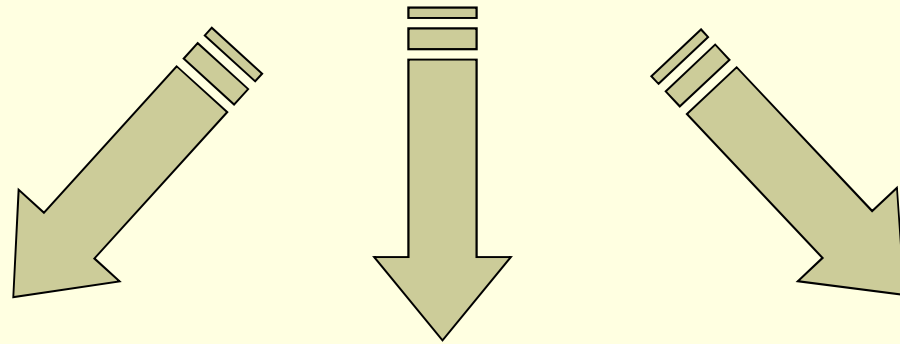


Microbial growth in the presence of enhanced concentration of explosives. Wide spectrum of explosives used by microorganisms.

## 2. The objectives and deliverables for the current project (2009-2010).

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Microorganisms with  
explosives-degrading ability



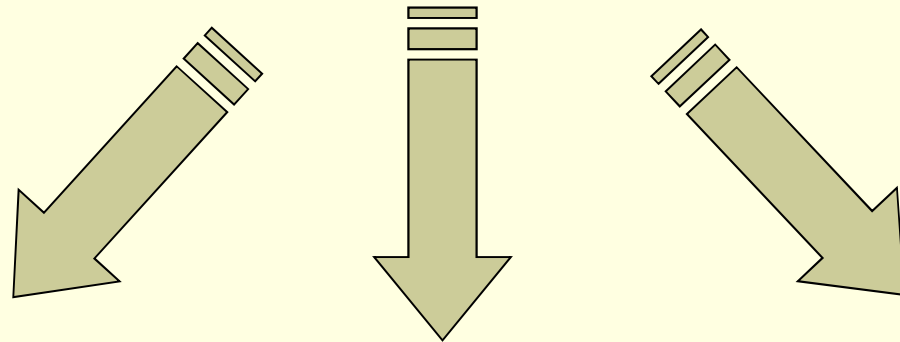
Type of  
contamination

Experimental  
design

Biotechnological  
approach

## 2. The objectives and deliverables for the current project (2009-2010).

Type of contamination



Pure TNT,  
RDX

“Brown  
powder”

Sludge from  
the plant

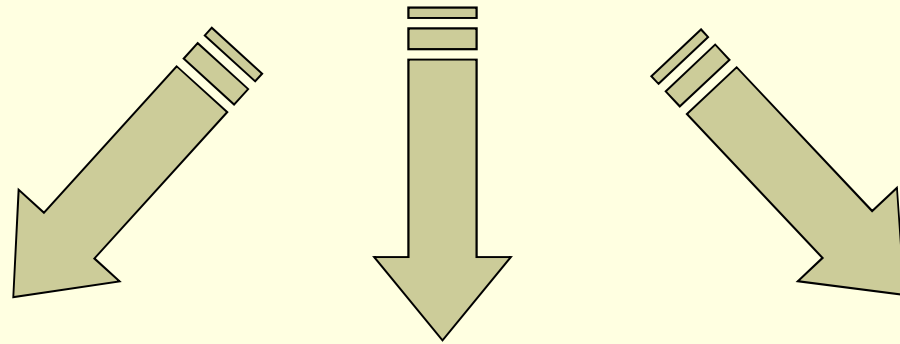
Source



## 2. The objectives and deliverables for the current project (2009-2010).

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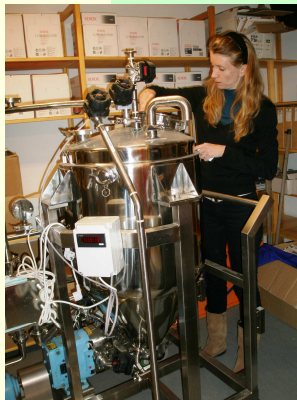
Experimental  
design, scale



Laboratory



Pilot



Field



## 2. The objectives and deliverables for the current project (2009-2010).

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Biotechnological approach

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graph TD; A[Biotechnological approach] --> B[Biostimulation]; A --> C[Bioaugmentation]; A --> D[Phytoremediation];
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Biostimulation

Addition of nutrients to soil

Bioaugmentation

Addition of microorganisms to soil

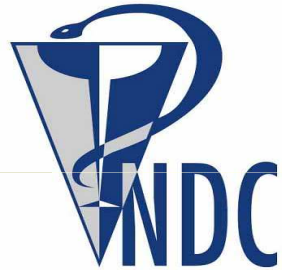
Phytoremediation

Use of higher plants

## The results are summarized in publications:

1. Muter O., Dubova L., Zarina D. Microbial activity in the soils contaminated with nitramines and nitroaromatic compounds. Int. Conf. on Environ. Biotechnology, 9-13 July, 2006, Leipzig, **Germany**, p.71.
2. Muter O., Dubova L., Saulite L., Grube M., Zarina D. Microorganisms isolation from soils contaminated with nitramines and nitroaromatic compounds. 11th Int. Symp. on Microbial Ecology, ISME-11, 2006, Vienna, **Austria**, p.422.
3. Grube M. and Muter O. FT-IR Use for Particular Medium Component Balance Studies during the degradation of Explosives by Soil Bacteria. 12th European Conf. on the Spectroscopy of Biological Molecules. Bobigny, **France**, 1-6-September, 2007, P.331.
4. Muter O.; Versilovskis A.; Scherbaka R., Grube M.; Zarina Dz. Effect of plant extract on the degradation of nitroaromatic compounds by soil microorganisms. **J. Ind. Microbiol. Biotechnol.** 2008, 35: 1539-1543.
5. Grube M.; Muter O.; Strikauska S.; Gavare M.; Limane B. Application of FT-IR for control of the medium composition during biodegradation of nitro aromatic compounds. **J. Ind. Microbiol. Biotechnol.** 2008, 35: 1545-1549.
6. Dubova L., Limane B., Muter O., Versilovskis A., Zarina D., Alsina I. Effect of nitroaromatic compounds to the growth of potted plants. In: "Current Research Topics in Applied Microbiology and Microbial Biotechnology", **Ed. Antonio Mendez-Vilas World Scientific Publishing** Co. 2009, 24-28.
7. Limane B., Juhanson J., Truu J., Truu M., Muter O., Dubova L., Zarina D. Changes in microbial population affected by physico-chemical conditions of soils contaminated by explosives. In: "Current Research Topics in Applied Microbiology and Microbial Biotechnology", **Ed. Antonio Mendez-Vilas World Scientific Publishing** Co. 2009, 637-640.
8. Nehrenheim E., Odlare M., Rodriguez A., Muter O. Demilitarization industry sludge: assessment of biodegradation potential. Water & Industry, **New Zealand** 30 November-2 December 2009, P....

## Multidisciplinary approach in this study was achieved with participation of:



- Ministry of Defense of the Republic of Latvia
- National Armed Forces of the Republic of Latvia
- Institute of Microbiology & Biotechnology, University of Latvia
  - Institute of Solid State Physics, Latvia
  - Latvian University of Agriculture
  - National Diagnostics Centre, Latvia
  - University of Tartu, Estonia
  - Mälardalen University, Sweden



**Thank you!**