

TAKING  
**COOPERATION**  
FORWARD



BMT and CSIA Technical Seminar  
Parma | 29<sup>th</sup> of March 2019



## **BMTs Tools for natural and enhanced bioremediation implementation in Parma**



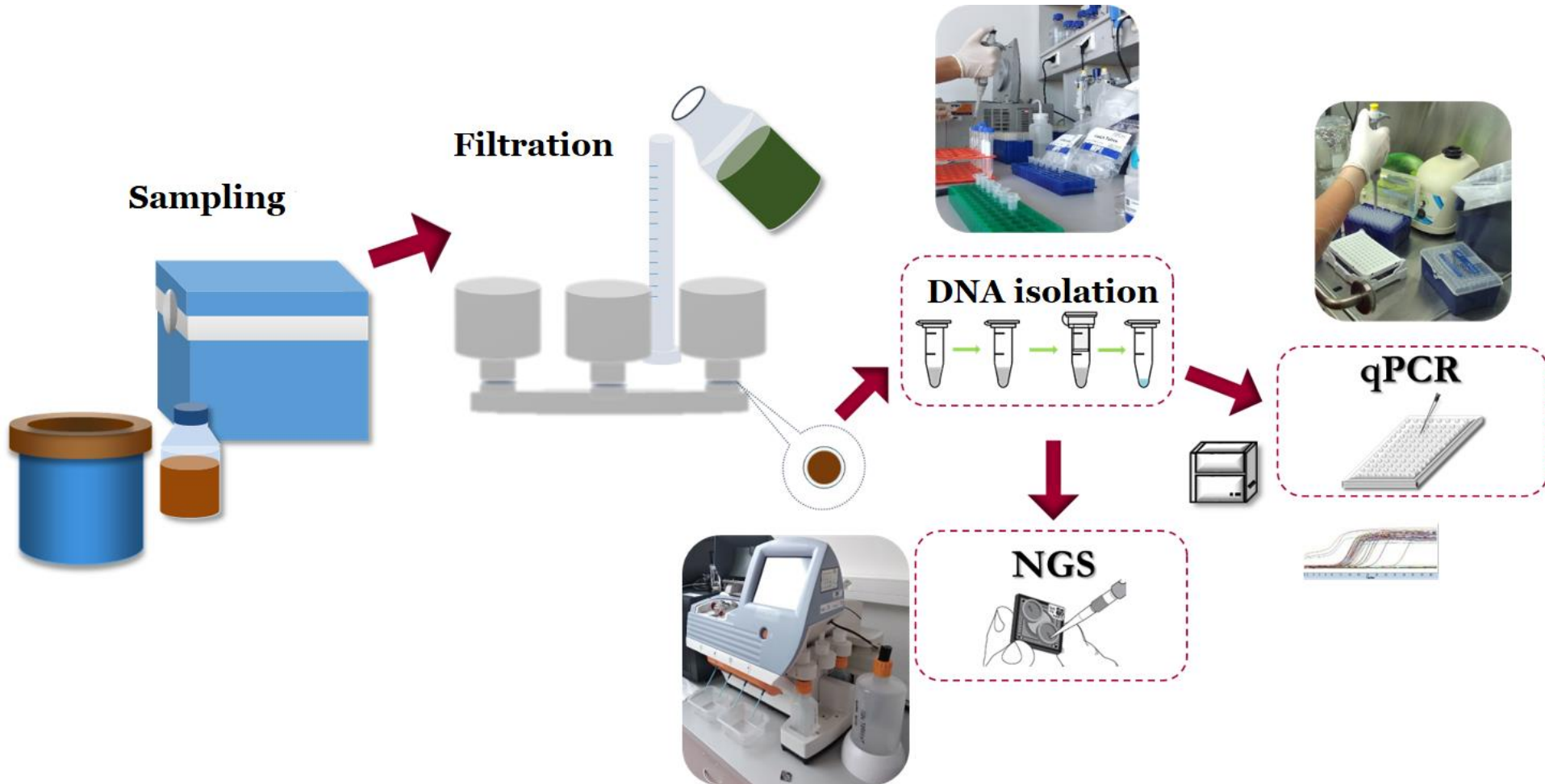
Institute for Nanomaterials, Advanced Technologies and Innovation, Technical University of  
Liberec, Liberec, Czech Republic

## ■ Capability of microorganisms to degrade pollutants

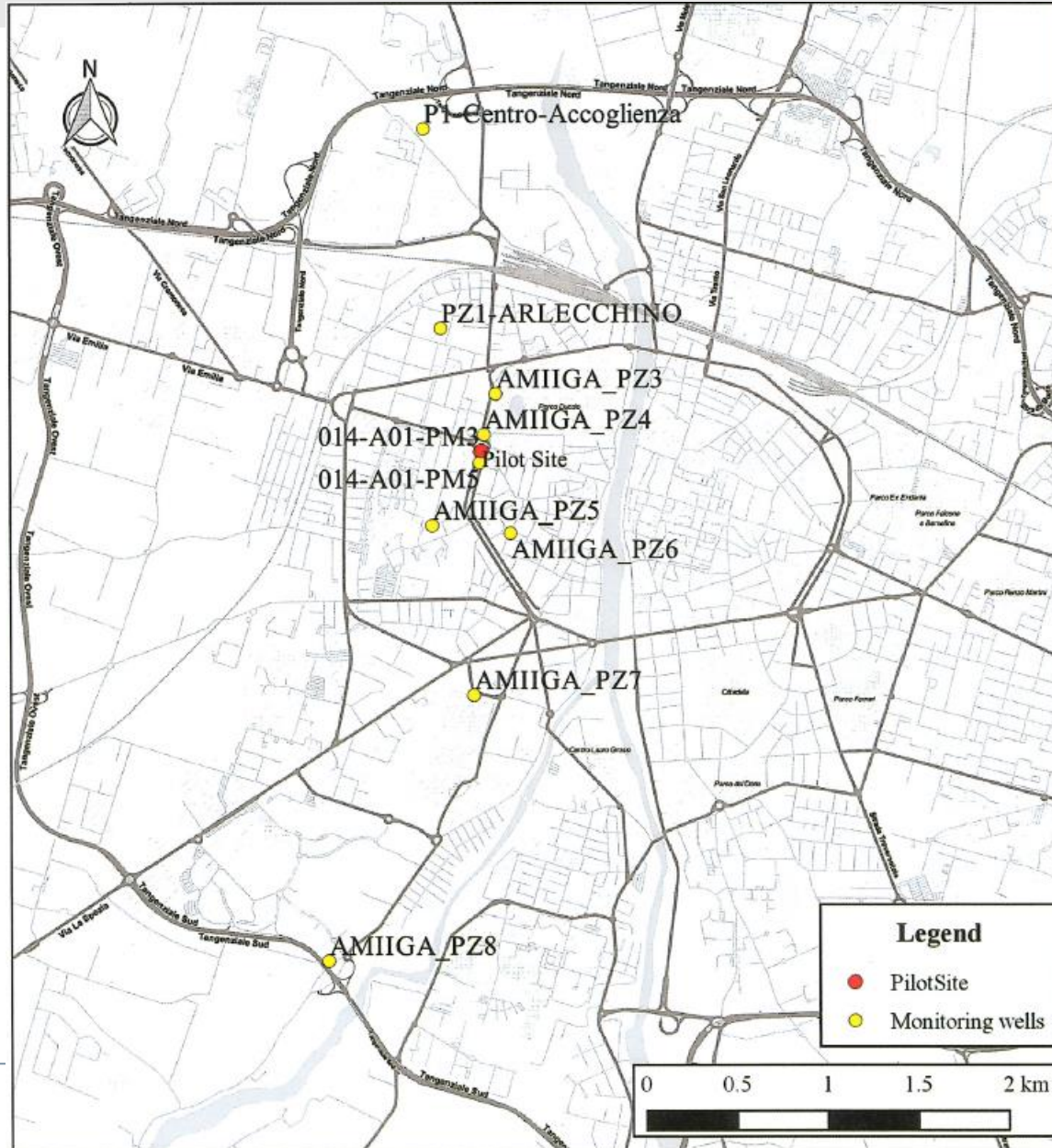
- Total bacterial biomass (16S rDNA)
- Organohalide respiring bacteria
- Nitrifying and denitrifying bacteria
- HCH degraders (lindanes)
- Sulphate-reducing bacteria
- Iron oxidizing and reducing bacteria
- BTEX degraders



# BMT methods



# Map of Parma site



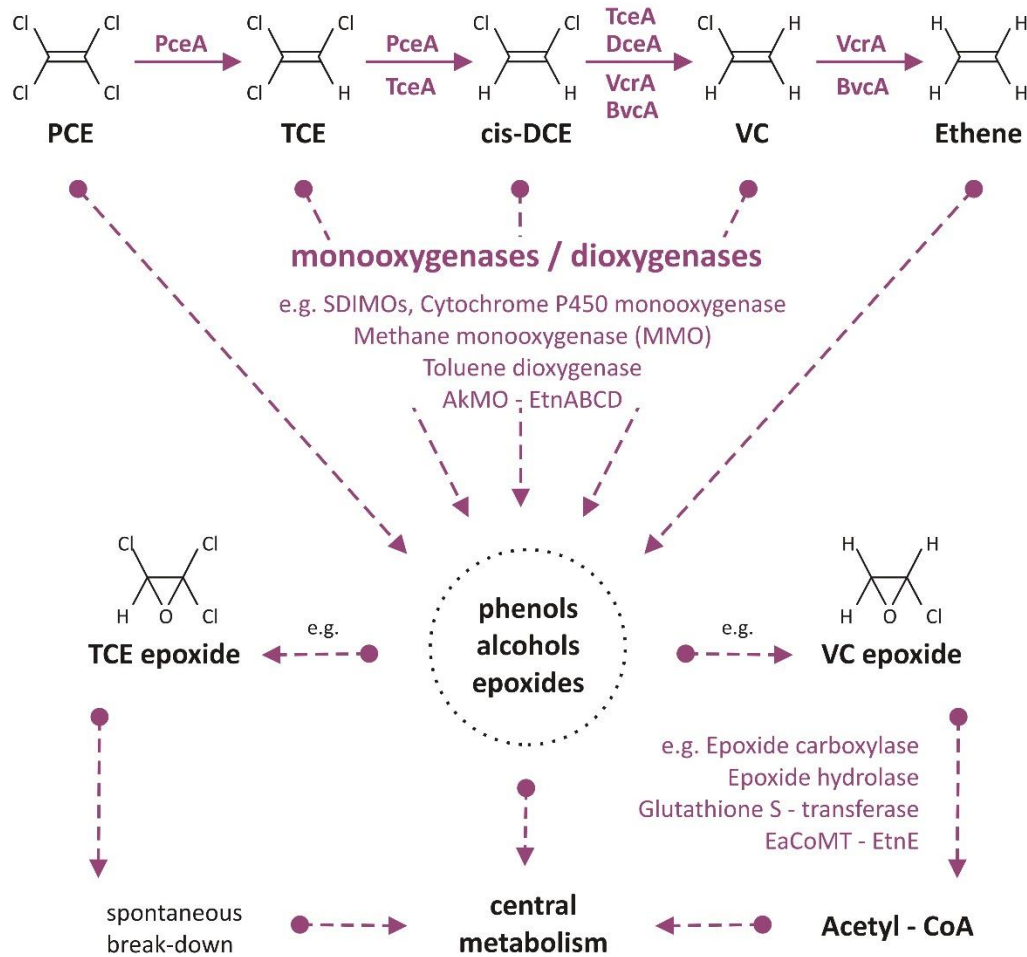


## ■ Parma, IT (contaminant: CEs)

- 1<sup>st</sup> BMT sampling in December 2017, 2<sup>nd</sup> in May 2018
- Groundwater samples
- Selected markers for BMT testing:
  - > Universal marker of 16S rDNA - **U16SRT**
  - > Organohalide respiring bacteria - *bvca* and *vcrA* (VC reductases), *DHC-RT* (*Dehalococcoides mccartyi*), *Dsb* (*Desulfitobacterium* sp.), *Dre* (*Dehalobacter* sp.)
  - > Sulphate reducing b.- *dsrA2* (dissimilatory sulphate reductase)
  - > Denitrifying bacteria - *nirK* (nitrite reductase)
  - > Nitrifying bacteria - *AmoA* (ammonium monooxygenase)
  - > HCH degrader - *linA* ( $\gamma$ -HCH dehydrochlorinase)
  - > BTEX degraders - *DEF/G* (catechol-2,3-dioxygenase), *bssA* (alpha subunit of benzylsuccinate synthase gene)



# CEs biodegradation



# Parma - BMT results from 1<sup>st</sup> sampling



	Total bacterial biomass
	Organohalide reducing
	Sulphate reducing
	Denitrifying
	HCH degraders
	BTEX degraders

Groundwater						
Primer	PM3	PM5	PZ3	PZ4	PZ5	PZ8
U16SRT						
bvcA						
vcrA						
DHC-RT						
Dsb						
Dre						
dsrA2						
nirK						
linA						
DEF/G						
bssA						

## Successful detection:

- Dehalobacter* sp.
- Denitrifying bacteria
- BTEX degraders
- Organohalide respiring bacteria detected in low levels
- PM5 and PZ4 showed too low DNA concentration



# Parma - BMT results from 2<sup>nd</sup> sampling



	Total bacterial biomass
	Organohalide reducing
	Sulphate reducing
	Denitrifying
	HCH degraders
	BTEX degraders

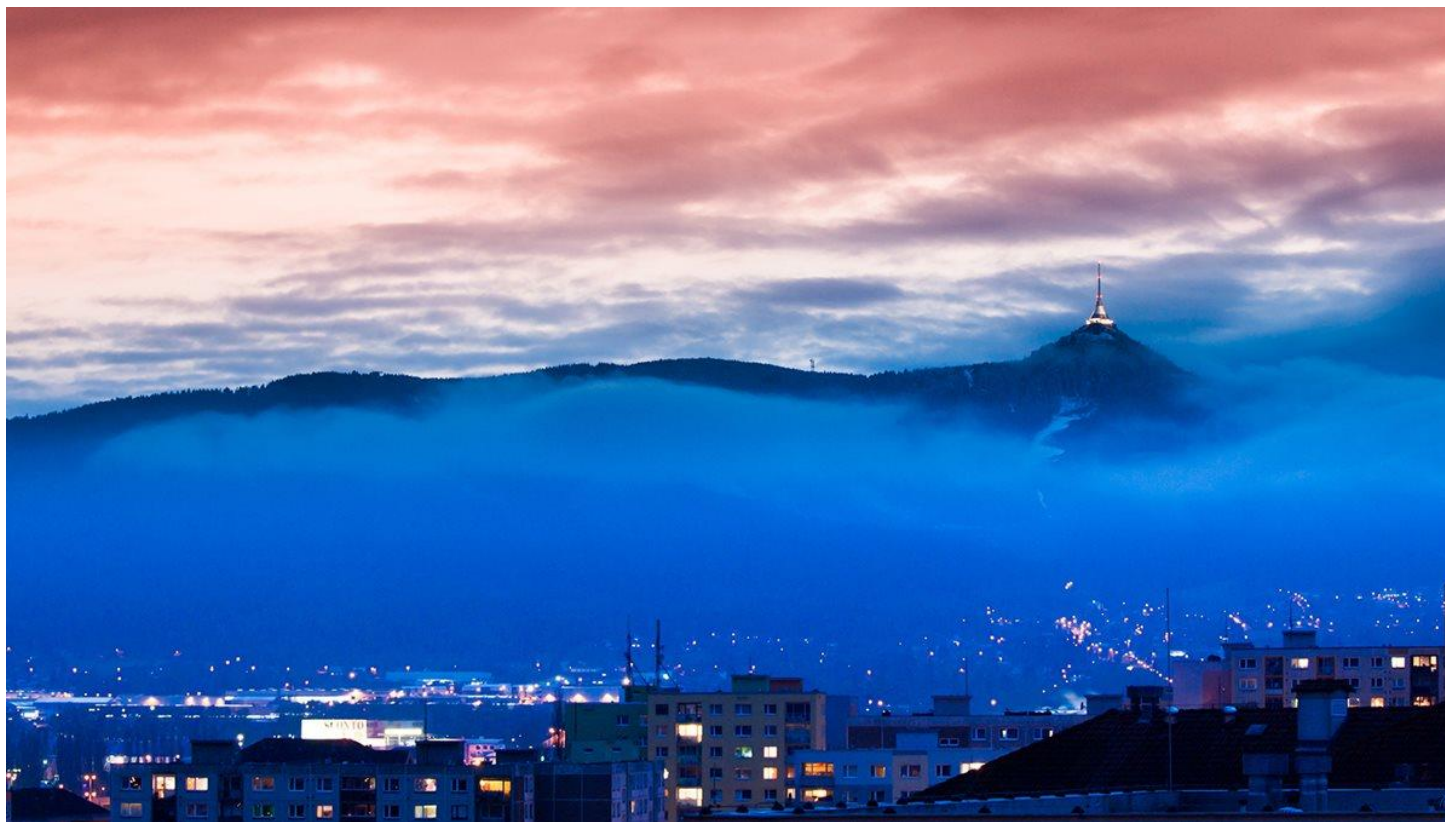
Groundwater						
Primer	PM3	PM5	PZ3	PZ4	PZ5	PZ8
U16SRT						
bvcA						
vcrA						
DHC-RT						
Dsb						
Dre						
dsrA2						
nirK						
linA						
DEF/G						
bssA						

## Successful detection:

- Denitrifying bacteria
- Sulfate-reducing bacteria
- BTEX degraders
- Almost no organohalide respiring bacteria detected
- PM5 and PZ8 showed very low DNA concentration







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**THANK YOU FOR YOUR ATTENTION**

