



# REPORT

# 1<sup>st</sup> TwiNSol-CECs Summer School Analytical Methodologies for Determination of CECs in the Environment University of Novi Sad, Faculty of Technology Novi Sad (TFNS) Novi Sad, Serbia July 02-06, 2023

The 1<sup>st</sup> TwiNSol-CECs Summer School "Analytical Methodologies for Determination of CECs in the Environment" was organized by TFNS on July 02-06, 2023, as a part of activities planned within Work Package no. 3 "Reinforcing research knowledge and skills of TFNS" of the TwiNSol-CECs project (GA 101059867).

The Summer School was organized as a one-week scientific event in the Blue Hall of TFNS. The Summer School consisted of theoretical and practical lessons to provide additional knowledge for the attendees.

Main topics of the Summer School were:

- water stressors and challenges in front of the global water resources;
- conventional wastewater treatment and micropollutants;
- compounds of emerging concern (CECs);
- a regulatory perspective on CECs;
- sampling and analytical approaches for determination of the CECs environmental occurrence;
- suspect and non-target analysis;

The parallel topics important for creation of international research projects and multidisciplinary research teams on the latest challenges in front of the transition towards a toxic free environment, were also included in the School's program:

- experience in the Horizon Europe project how to prepare a successful project proposal
- Life Cycle Assessment: the most inclusive method to analyze environmental benefits and trade-offs resulting from complex systems.

The Committees of the School, chaired by Prof. Nataša Đurišić-Mladenović (TFNS), consisted of the researchers from Spanish National Research Council, Institute of Environmental Assessment and Water Research (CSIC-IDAEA), Barcelona, Spain, and TFNS, as follows:







Scientific Committee	Organizing Committee
Dr. Igor Antić, TFNS	Dr. Maja Buljovčić, TFNS
Dr. Marinella Farre, CSIC-IDAEA*	Dr. Ivana Lončarević, TFNS
Dr. Ferenc Kiss, TFNS	Dr. Nikola Maravić, TFNS
Dr. Dragana Lukić, TFNS	Prof. Dr. Biljana Pajin, TFNS
Dr. Marta Llorca, CSIC-IDAEA*	Dr. Sanja Panić, TFNS
Dr. Nicola Montemurro, CSIC-IDAEA*	Dr. Jovana Petrović, TFNS
Dr. Vesna Vasić, TFNS	Prof. Dr. Zita Šereš, TFNS
Dr. Jelena Živančev, TFNS	Prof. Dr. Dragana Šoronja-Simović, TFNS
	Jelena Šurlan, MSc, TFNS
Committee for for Summer School Grant Approval	
Dr. Nicola Montemurro, CSIC-IDAEA*	
Dr. Jelena Živančev, TFNS	
Dr. Sanja Panić, TFNS	

The participants were selected according to the procedure accepted by the Project Steering Team and the accompanying decisions of the Team. In total, there were 10 grantholders whose place of residence is more than 80 km from Novi Sad, including those from Western Balkan countries other than Serbia, and there were 3 registered participants from the University of Novi Sad. There were 5 PhD students, 5 early stage researchers, 2 senior researchers, and 1 expert. 2 participants came from North Macedonia, 1 from Bosnia and Herzegovina, and 1 from Montenegro; 4 were from University of Niš in Serbia, 2 from University of Belgrade, and 3 from University of Novi Sad. The 500 Euros grants covered fully the accommodation (BB) of the grantholders in a hotel in Novi Sad, and the remaining part was handed over to the grantholders to cover part of the travel and stay costs in Novi Sad. For these 14 registered participants, all theoretical and practical sessions, including social events and coffee and lunch breaks, were fully accessible. The School theoretical lectures held in the Blue Hall were opened for all interested researchers from TFNS, who had been invited by email from TFNS Vice-Dear for Science.

The Program of the School is attached to the Report. The lectures and practical sessions were delivered by TwiNSol-CECs researchers from the Institute of Environmental Assessment and Water Research of the Spanish National Research Council (CSIC) and TFNS. During the first day registration, all grantholders and registered participants from University of Novi Sad obtained the promotional package consisted of backpacks, in which the following items were included: the Summer School program, glass water bottle, brochure of the project, pencil and notebook, USB; all items are marked at least with obligatory visual elements for identifying the funding source, EU, and the project itself. The registered participants signed the attendance lists each day; they were informed that by signing they granted the permission and gave the consent to TwiNSol-CECs team for the use of photograph(s) or electronic media images taken/made at the 1st TwiNSol-CECs Summer School for presentation under any legal use. Additionally by signing they also gave the consent to the project team to include their email addresses in the mailing list for receiving project information and invitations to project







events. The participants also had an option to opt for not giving the personal data and photos to be used.

The breaks in the schools' program for refreshment and lunch during the five days of school, as well as the Official dinner, were covered fully by the project budget. There were also additional social events organized by TFNS such as Novi Sad tour with the professional tourist guide, and visit to some sights in the nearby town of Sremski Karlovci.

In accordance to the Summer School Programme (in Annex I of the Report) at the beginning of the 1st TwiNsol-CECs Summer School, Prof. Biljana Pajin, Dean of TFNS, gave a welcome speech to the participants, highlighting the importance of rising institutional, national, and regional excellence. Afterwards, Prof. Zita Šereš, Vice-dean for Science at TFNS presented the importance of cooperation between universities, summarizing the achievements and capacities of the Faculty so far. Prof. Nataša Đurišić-Mladenović, TwiNSol-CECs Project Coordinator, pointed out the main goals and presented the consortium of TwiNSol-CECs project, underling the expected impact of TwiNS-CECs project. Afterwards Prof. Đurišić-Mladenović shared her experience in the Horizon Europe project, giving the participants valuable information how to prepare a project proposal such as TwiNSol-CECs. After the lunch on the first day, the registered participants introduced themselves, emphasizing the motivation to participate in the Summer School. At the afternoon, Novi Sad City Tour for interested participants were organized.

On the second day of the Summer School, Dr Vesna Vasić gave a presentation on "Water stressors and challenges in front of global water resources" presenting the global problems with the protection of water resource to the participants. Moreover, Dr Dragana Lukić in the lecture "Conventional wastewater treatment and micropollutants" emphasized the challenges of the occurrence of micropollutants, including CECs, in wastewater and the efficiency of different wastewater treatments on the removal. In the lecture "Chemistry and the fate of contaminants of emerging concern in the environment", Dr Igor Antić introduced the participants with the term "contaminants of emerging concern", informing them also about the ubiquitous presence of these contaminants in the environment. Dr Jelena Živančev presented techniques for CECs analysis, and explained the procedure for risk assessment during the lecture entitled "Contaminants of emerging concern in the environment: analysis, occurrence, effects and risks". Dr Nicola Montemurro gave a lecture on "Fate of contaminants of emerging concern in crops and biota", introducing the participants with the translocation of the CECs from the water to biota. After the lunch, Dr Jelena Živančev and Dr Igor Antić introduced the participants with the equipment at disposal to the TFNS TwiNSol-CECs team for the CECs analysis.

The third day in Summer School started with lecture "Sampling protocols and measurement parameters for chemical analysis" when Dr Igor Antić explained to the participants how to take representative samples of water and shared the experience on different sampling protocols. Dr Jelena Živančev explained to the participants procedures for extraction of contaminants of emerging concern from water samples during the lecture "Extraction of contaminants of emerging concern from water







samples". Dr Nicola Montemurro presented the best extraction technique of CECs from solid samples in the lecture "Extraction of contaminants of emerging concern from solid samples". At the practical session, Dr Jelena Živančev and Dr. Igor Antić demonstrated to the participants solid phase extraction procedure, which is often used for extraction of CECs from water samples. At end of the day for, visit to Sremski Karlovci was organized for the interested participants.

During the fourth day of the Summer School, Dr Nicola Montemurro presented the basic of Mass Spectrometry and explained analysis of CECs in the lecture "Mass Spectrometry Fundamentals". In online lecture "Computer tools for identification of compounds using HRMS" by Frans Schoutsen, a product specialist at Thermo Fisher Scientific, introduced the participants with dedicated software for processing of high resolution mass spectra, i.e. Thermo Scientific<sup>™</sup> Compound Discoverer<sup>™</sup> purchased within TwiNSol-CECs. In the afternoon session Dr Nicola Montemurro and Igor Antić demonstrated to the participants how Compound Discoverer<sup>™</sup> software for wide range screening of CECs by UHPLC-HRMS works. At the end of the day official dinner was organized in a restaurant.

On the last day of the Summer School Dr Ferenc Kiss in a lecture "Life Cycle Assessment: the most inclusive method to analyze environmental benefits and trade-offs resulting from complex systems" explained the role of Life Cycle Assessment for analysing environmental benefits ad the carbon footprints of the complex systems, including those for removal of contaminants from wastewater. Afterwards, the participants had a chance to point out the most valuable information they got during the School, as well the comments regarding the CECs analysis. The participants were asked to complete the questionnaire on the School organization; the results of the questionnaires assessment in the part of this report (Annex II). At the closing of the 1st TwinSol-CECs Summer School, At the very end of the School, before the lunch, Prof. Nataša Đurišić-Mladenović wrapped up all the presented information during the School and handed out the certificates on the attendance to the participants.

Selected photos took during the 1st TwiNsol-CECs Summer School are available in Annex III of the Report.

Disclaimer

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or EU executive agency. Neither the European Union nor the granting authority can be held responsible for them.







#### Annex I

# 1<sup>st</sup> TwiNSol-CECs Summer School

# Analytical Methodologies for Determination of CECs in the Environment

# University of Novi Sad, Faculty of Technology Novi Sad (TFNS) Novi Sad, 02-06 July 2023

#### Program

# 2 July 2023 Sunday

- 10,30-11,00 Registration of participants
- 11,00-11,10 Welcome speech, Prof. Biljana Pajin, Dean ((TFNS, Novi Sad, Serbia)
- 11,10-11,25 Presentation of TFNS, Prof. Zita Šereš, Vice-Dean for Science (TFNS, Novi Sad, Serbia)
- 11,25-11,40 Presentation of TwiNSol-CECs project, **Prof. Nataša Đurišić-Mladenović** (TFNS, Novi Sad, Serbia)
- 11,40-12,10 Coffee break
- 12,10-13,00 Experience in the Horizon Europe project how to prepare a successful project proposal, **Prof. Nataša Đurišić-Mladenović** (TFNS, Novi Sad, Serbia)
- 13,00-14,30 Lunch
- 14,30-16,00 Introduction of the attendees and motivation to participate in the 1<sup>st</sup> TwiNSol-CECs Summer School (5 min per attendee, follow by QA)
- 16,00 Novi Sad City Tour

# 3 July 2023 Monday

- 10,00-10,30 Water stressors and challenges in front of global water resources, **Dr Vesna Vasić** (TFNS, Novi Sad, Serbia)
- 10,30-11,00 Conventional wastewater treatment and micropollutants, **Dr Dragana Lukić** (TFNS, Novi Sad, Serbia)
- 11,00-11,30 Chemistry and the fate of contaminants of emerging concern in the environment, **Dr Igor Antić** (TFNS, Novi Sad, Serbia)
- 11,30-12,00 Coffee break
- 12,00-12,30 Contaminants of emerging concern in the environment: analysis, occurrence, effects and risks, **Dr Jelena Živančev** (TFNS, Novi Sad, Serbia)
- 12,30-13,00 Fate of contaminants of emerging concern in crops and biota, **Dr Nicola Montemurro** (CSIC-IDAEA, Barcelona, Spain)
- 13,00-14,30 Lunch
- 14,30-17,00 Practical lessons







#### 4 July 2023 Tuesday

Sampling protocols and measurement parameters for chemical analysis, <b>Dr Igor Antić</b> (TENS, Novi Sad, Serbia), Dr Nicola Montemurro (CSIC-IDAEA, Barcelona, Spain)
Extraction of contaminants of emerging concern from water samples – Part I. Dr Olga
Cómoz Navarro (CSIC IDAEA, Parcolona, Spain) <b>Dr. Jolona Živančov</b> (TENS, Novi Sad
Sorbia)
Coffee break
Extraction of contaminants of emerging concern from water samples – Part II. Dr Olga
Cómoz Navarro (CSIC IDAEA, Parcolona, Spain) <b>Dr Jolona Živančov</b> (TENS, Novi Sad
Serbia)
Extraction of contaminants of emerging concern from solid samples <b>Dr Nicola</b>
Montemurro (CSIC-IDAFA, Barcelona, Spain)
Lunch
Practical lessons
Visit to Sremski Karlovci
5 July 2023 Wednesday
Mass Spectrometry Fundamentals – I part, <b>Dr Nicola Montemurro</b> (CSIC-IDAEA,
Barcelona, Spain)
Coffee break
Mass Spectrometry Fundamentals – II part, Dr Nicola Montemurro (CSIC-IDAEA,
Barcelona, Spain)
Computer tools for identification of compounds using HRMS, Frans Schoutsen (Thermo
Fisher Scientific, Netherlands) online presentation
Lunch
Practical lessons
Official dinner
6 July 2023 Thursday
Life Cycle Assessment: the most inclusive method to analyze environmental benefits
and trade-offs resulting from complex systems, <b>Dr Ferenc Kiss</b> (TFNS, Novi Sad,
Serbia) Presentations of the attendees
Questionnaire on the School organization
Certificates award
School Wrap-up
Lunch with coffee







SUMMER SCHOOL EVALUATION SURVEY		
	Organized within TwiNSol-CECs project (GA101059867) University of Novi Sad, Faculty of Technology, July 2-6, 2023	
1. How wo Methodol a) Ex b) G c) Av d) Po e) Ve	uld you rate the overall quality of the 1 <sup>st</sup> TwiNSol-CECs Summer school on Analytical ogies for Determination of CECs in the Environment? cellent pod rerage loor re Poor	
2. Did the a) Ye b) Ye c) No	s, it exceeded my expectations in terms of content coverage? s, it exceeded my expectations s, it met my expectations s, it fell short of my expectations	
4. How lik a) Ve b) Lil c) Ne d) Ui e) Ve	ely would you to attend the TwiNSol-CECs Summer School again? ry likely rely eutral likely ury unlikely	
5. Do you Analytical	have any suggestions or comments for improving the 1 <sup>st</sup> TwiNSol-CECs Summer school on Methodologies for Determination of CECs in the Environment?	
	Thank you for your participation!	
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#### Annex II Ouestionnaire on the 1<sup>st</sup> TwiNSol-CECs Summer School

#### Assessment of the completed questionnaires

17 questionnaires were completed.

- 1. Question: All of the participants answered **"YES"** rated as EXCELLENT the quality of the Summer School.
- 2. Question: 15 participants answered that the Summer School exceeded their own expectations, while 2 participants felt that their expectations are met by the Summer School







- Question: different answers, sometimes multiple, were obtained on "Which specific lecture/activity did you find most valuable during the Summer School?":
  9 participants singled out the presentation on sampling and/or sample preparation, 3 mentioned that all the presentation were valuable, 3 mentioned the presentation on preparation of the Horizon Europe, 1 on chemistry and fate of CECs, 1 the presentation on MS fundamentals, 3 on specially dedicated software for HRMS spectra assessment, 2 mentioned practical sessions as the most valuable.
- 4. Question: 15 participants answered that very likely they would attend the TwiNSol-CECs Summer School again, 1 answered as "likely", while 1 as "neutral"
- 5. Question: There were no suggestion for improvement of the TwiNSol-CECs Summer School, as all the given comments praised the organization of the School.







Annex III Selected photos during the Summer School



Part of the promotional materials prepared for the registered 1<sup>st</sup> TwiNSol-CECs Summer School participants



Posters at the TFNS entrance and in front of the TFNS Blue Hall announcing the 1<sup>st</sup> TwiNSol-CECs Summer School









At the registration desk during the registration of participants at the the very beginning of the 1<sup>st</sup> TwiNSol-CECs Summer School









Welcome speech of Prof. Biljana Pajin, Dean of TFNS, on opening of 1<sup>st</sup> TwiNSol-CECs Summer School



Prof. Zita Šereš, Vice Dean for Science of TFNS presented TFNS during the opening ceremony of the 1<sup>st</sup> TwiNSol-CECs Summer School









Presentation of TwiNSol-CECs project by Prof. Nataša Đurišić-Mladenović





Lunch breaks of the 1<sup>st</sup> TwiNSol-CECs Summer School











Lectures of Dr Vesna Vasić (up) and Dr Dragana Lukić (down)









Lectures of Dr Igor Antić (up) and Dr Jelena Živančev (down)











Lectures of Dr Nicola Montemurro









Online presentation by Frans Schoutsen



Lecture of Dr Ferenc Kiss on Life Cycle Assessment as a valuable tool for carbon footprint assessment of complex systems









Introduction of the participants at the 1st TwiNSol-CECs Summer School









Novi Sad City Tour (up) and visit to Sremski Karlovci (down) with the grantholders of the 1<sup>st</sup> TwiNSol-CECs Summer School









Presentation of the TFNS capacities for CECs monitoring









Registered participants in lab coats prepared within TwiNSol-CECs with the obligatory visual elements



Details from practical sessions on sample preparation of the 1<sup>st</sup> TwiNSol-CECs Summer School









Details from practical sessions on software tool for HRMS processing









Official dinner for the registered participants, lecturers, and the Organizing Committee members



At the very end of the 1<sup>st</sup> TwiNSol-CECs Summer School after the certificates award













Statements about the 1<sup>st</sup> TwiNSol-CECs Summer School given for the TFNS and the project youtube canals by Prof. Nataša Đurišić-Mladenović, Dr Nicola Montemurro, and Dr Jelena Živančev

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