



“The Journal of the training week wants to be a summary of the activities for the fellows and partners as well as a mean of communication to everyone else interested in the activities of the SMARTI ETN.

In this occasion the University of Palermo and the coordination at the University of Nottingham hosted a training week that focused the attention on the role that “Sustainability” could have on the SMARTI vision. This was done by providing the fellow with the latest research trends in Transport infrastructure engineering and by delivering a workshop aimed at brainstorming methodologies to introducing sustainability in education.”

*Davide Lo Presti, Project Coordinator*

## 1st DAY - STRUCTURAL HEALTH MONITORING

**Fabio Remondino (Fondazione Bruno Kessler)** - 3D surveying applied to Civil Infrastructures

**Alberto di Matteo (UNIPA)** - How to monitor vibrations: Traditional Tools

**Chiara Masnata (UNIPA)** - How to monitor vibrations: Advanced Tools

**Alberto Maltese (UNIPA)** - UAV – Geomatics applications with infrared thermography

**Alessandro Scordo (E.lab) & Laura Inzerillo (UNIPA)** - UAV photogrammetry for pavement distress analysis: application and processing

1st Day of SMARTI ETN Palermo Summer School was focused on the structural health monitoring in transport infrastructures. Having an opportunity to see how the various techniques and equipment is used for the surface monitoring, gave the students better perspective about how the data behind their research is obtained and helped them understand its benefits and applications.

Maria Barriera (ESR2): *“I think that even if we are not going to use these techniques it is always good to have a general overview of techniques and valuable instrumentation, in my case the detection of pavement distresses.”*

Fabio Remondino from Fondazione Bruno Kessler opened the 1st day of Palermo Summer School with his lecture on the importance of the various applications of the 3D Surveying Techniques to the civil infrastructures. We asked Fabio what he thinks about SMARTI ETN programme and how it can impact transport infrastructures: *“SMARTI project is a good interdisciplinary network of experts and fellows in the field of transport and infrastructures. The project is very important in the light of bringing more security to infrastructures, better monitoring strategies, new constructions materials, sustainability, etc.”*

Ronald Roberts (ESR12): *“Fabio is on top of his field, he is really good. Half the papers that I am reading are written by him. So if you are going to have somebody talking about 3d surveying he is the guy that you want to hear. So having him to start the day was fantastic.”*

During the workshop “UAV photogrammetry for pavement distress analysis” Laura Inzerillo (UNIPA) and Alessandro Scordo (E.Lab), showed the fellows how to use a quadcopter drone (Giacomino) to build a 3D model of the garden at the Mondello Palace Hotel, which could be used to recognize the distress of the pavement and directly implemented in their research.



## 2nd DAY – SUSTAINABLE TECHNOLOGY DEVELOPMENT

**Orazio Baglieri (POLITO) & Geatano Di Mino (UNIPA)** - Recycling in asphalt pavements: laboratory design and plant manufacturing

**Geatano Di Mino (UNIPA)** - Recycling in asphalt pavements: circular models

**Davide Lo Presti (UNOTT)** - Sustainability Assessment & EcoDesign

**Davide Lo Presti (UNOTT) & Oumaya Marzouk (CEREMA)** - LCA and road pavements

**Oumaya Marzouk (CEREMA)** - A proposal for transferring sustainability knowledge to industry in France



The sustainable approach to transport infrastructure engineering is getting more and more important due to challenges such as climate change and more extreme weather events, population growth and greater traffic volume. Due to the ever-growing problem of the sustainable future of our planet, it was really important to discuss this issue and explore the advantages of Life Cycle Assessment as crucial tool in project management.

Domenico Vizzari (ESR3): "In terms of LCA, I think it can be applied not now but in the future to my project, since now I am working more on the technical aspect of the project. But if I expect to realise the prototype and to realise the project in full scale the LCA could be very useful, because it can be involved in the new materials that I am using on my project so I can evaluate what is the effect of these new materials that I am using in my prototypes."

Philippe Sohounou (ESR9): "In my case, I am working on the road networks for design and maintenance for risks and resilience, but I am already thinking of including environmental costs as the way of doing multicriteria analysis as the way to compare repair strategies and design strategies so that was interesting to see from the perspective of LCA and help me to find a way to include environmental costs in my project."

During the lecture of prof. Di Mino and dr. Lo Presti, a discussion opened up about the transition from a linear to a circular economy in terms of transport infrastructures. Creative dialogue involving both fellows and professors showed that they have a different approach to the subject but at the end, they all agreed that sustainable thinking should be the end goal.

Oumaya Marzouk (CEREMA) shared her impression about training week and SMARTI ETN programme in general: "I like it very much because it addresses many subjects around one topic (transport infrastructures), so it can get solutions for several problems, working together, which is a very good strategy. It is very complete. For me it's a wonderful idea, I don't know all the topics and PhDs but the general idea and training is fantastic. This week allowed me to know many people working on this topic, I could transfer my knowledge to them and it is direct contact with the student, it is not a normal lecture, or like a speech in a conference, but a much more close interaction."

Fellows got hands-on experience with a **Life Cycle Assessment (LCA)** software, developed in **IFSTTAR**, directly by its creators **Agnes Jullien** and **Chantal Proust**, which have given them better insight about the process and what is needed to perform it.

Even though Life Cycle Assessment (LCA) as concept/technique is not included in all SMARTI projects, educating fellows about the beneficial part that has in project management, especially if you want to get funding from European Commission (I would change this part).

**Andreas Ciroth**, CEO of **GreenDelta** and creator of **OpenLCA**, as a Life Cycle Assessment expert and tool developer, talked about the benefits of LCA techniques and tools and encouraged SMARTI ETN fellows to include them in their research projects. Answering the question how he sees the future of sustainability assessment in transport infrastructures and how SMARTI ETN could contribute, Andreas said: "That is a very large question I think; in short, verified, "true" sustainability assessment, which addresses all important sustainability impacts (and not more, but also not less, so this includes a social dimension typically), which is available faster and easier than nowadays, which is also based on using good tools and data. SMARTI contribution can be in the creation of cases for transport infrastructure, which could lead to these method advances. One concrete example can be data and a typical indicator set for transport infrastructure may be distinguished by several countries."



**Pawan Deep (ESR11)**: "I was not aware of LCA at all, and during the lectures I got to know more about new terms, new definitions and new aspects which will help us to incorporate more environmental and sustainable thinking in our current and future projects. This is why it is important to do the training and why it was a good experience." - "The specialized lecturers were able to share with us their passion about this topic".

**Iain Dunn (ESR6)**: "Even if my project is not related to LCA, learning about it was very interesting, specially having lectures from experts from all over the world, who I would not have met otherwise".

**Konstantinos Mantalovas (ESR10)**: "My project is about Life Cycle Sustainability Assessment so using different tools and seeing technical details in specific case studies was very helpful. If you want to write a future research proposal, sustainability assessment must be included".

**Ahmed Zakaria Hafez Mohamed (ESR5)**: "It was very good to know about the availability of databases and open software to perform LCA, although I also missed some more theory".

## 4th DAY – WORKSHOP: SUSTAINABILITY AND EDUCATION

**Andreas Ciroth (GreenDelta)** – Social LCA: Principle and case studies

**John Harvey (UCDAVIS) & Agnes Jullien (IFSTTAR)** - Introducing sustainability in Education: Lectures and Workshop



**Antonino Scalia (ESR13)**: "The workshop about sustainability in which we were asked to find sustainability policies and practices in a particular jurisdiction was very useful to see whether sustainability is being implemented in different places and how. I found this type of exercises very useful. I will start thinking about my project from the sustainability point of view"

**Paulina Leiva (ESR14)**: "I definitely enjoy Introducing Sustainability in Education, since people need to learn what sustainability is and how to move towards it in the future from early stages. I was very interesting to see that the speakers already have a plan on how to teach sustainability at different levels"

**Natasha (ESR15)**: "I think I never looked at my project from the sustainability point of view, and this week has opened my mind on this respect. Everything was new and I know I am aware of how important it is, but also how complex it is." - "The speakers were very interactive, which I really appreciate. They made sure we understood their topics"

