

Report on the outcomes of a Short-Term Scientific Mission

Action number: CA16228

Grantee name: **Sirin Botan**

Details of the STSM

Title: Railway Networks and Social Welfare

Start and end date: 01/02/2022 to 14/02/2022

Description of the work carried out during the STSM

The purpose of the STSM was to start working on a project with Jérôme Lang and Florian Sikora at LAMSADE at Paris-Dauphine University. Our project was inspired by the structural differences of various European railway networks and the connection to notions of social welfare. Our questions were related to how we might be able to choose which railways are the ‘best’ to build, and what it even means to be the best option. Related to this was of course how we wanted to think about the agents (or citizens) preferences.

During the visit we had many fruitful discussions among the three of us as well as other interested colleagues at LAMSADE. We met regularly in the time I was there and agreed on a two-pronged (so to speak) approach to the project.

For the first prong, we set out to define a formal model where we can study railway networks as a participatory budgeting-style problem. Each segment of railway tracks has a cost and an associated utility for the agents that might use it. Of course preferences in our model turn out to be quite tricky—if an agent would like to travel from city A to city B as well as from city A to city C, does this mean that they would like the shortest possible paths to be built between A and B, and A and C? Or alternatively, if an agent reports that they would like the segments (AB) and (BC) to be built, will they derive any utility from only (BC), considering they have no way to get to B from A?

For the second prong, we wanted to take data from existing European networks and examine them to see if we can find any connection between structural properties of networks and notions of social welfare. For example, if a network prefers to connect all smaller cities to one central city (as is the case in France where most cities have a connection to Paris, but not many have a railway segment between them) is this more utilitarian? For this we needed some data :what segments exist and how long does it take to travel between cities? Luckily this data exists, though we encountered some challenges trying to effectively obtain it from the relevant companies.

(max. 500 words)

Description of the STSM main achievements and planned follow-up activities

During the visit we were able to pin down an initial model and establish goals for the next step of the project. With this model in hand, an initial goal is to find well-performing rules. A first step is to examine existing rules from participatory budgeting to see whether they perform well for our aims. For the purposes of building railways, sequential rules may be a fruitful avenue to study. This is very much an active project and the hope is that work on the wider topic can continue in the long-term.

I will of course keep in touch with both Jérôme and Florian as we keep working on the project. We also hope to include other colleagues in the field who have worked within the area of participatory budgeting in the past.

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