



Evaluating the quality of pedestrian pavements in public space

Wanda DEBAUCHE

Head of Division – Mobility, Safety, Road Management
Belgian Road Research Centre

Road mobility projects in urban regions and their Impact on the environment

15-17 May 2023, Buenos Aires, Argentina

Index



Context



Equipment



2018: analysing the comfort and slip resistance of pedestrian pavements in the Brussels Capital Region



Data bank available on the geoportail of the Brussels Capital Region



Campagne of measurement for a municipality network



Conclusions



Context

- Pedestrian accessibility depends upon the quality of pedestrian pavements
- Multiple discussions about the quality of pedestrian pavements:
 - quality of use
 - urban and heritage quality
 - environmental quality



Context

- Importance of objectively evaluating the quality of use of pedestrian pavements

→ evenness

→ slip resistance

→ slope (crossfall and gradient)



- Research conducted in 2015 by BRRC at the request of Brussels Mobility:
 - to find specific equipment for measuring the quality of use of pedestrian pavements
 - requirements: fast evaluation, low cost, objective measure, ...
- No such equipment found!

Developing specific equipment

- In 2016: development of a first prototype to continuously measure the **evenness** (comfort) of pavements



- Use of an existing device (PFT) to continuously measure the **slip resistance** of pavements



Developing specific equipment

■ Survey by users (questionnaire) Call for participation




Test sheet on pedestrian coatings in the Brussels-Capital Region

Name:

Number of test section:

Question 1: What is the comfort level of the coating for you?

- Cotation : /10 (0 : impraticable) (10 : perfect)
- Thank you for justifying this quotation by evaluating the following possible problems:

 For the lonely or accompanied wheelchair user:	 For the visually impaired person :	 For other users (valid and less valid):
➢ Cervical pain caused by the coating <input type="checkbox"/> Low/Zero <input type="checkbox"/> Middle <input type="checkbox"/> High ➢ Force required to move <input type="checkbox"/> Low <input type="checkbox"/> Middle <input type="checkbox"/> High ➢ Irregularities of the surface (lack of flatness) <input type="checkbox"/> Low/Zero <input type="checkbox"/> Middle <input type="checkbox"/> High ➢ Discomfort caused to the wheels by the joints (width / depth) <input type="checkbox"/> Low/Zero <input type="checkbox"/> Middle <input type="checkbox"/> High ➢ Other elements justifying this quotation:	➢ Discomfort in the use of the white cane (arm pain, disturbance in the guidance) <input type="checkbox"/> Low <input type="checkbox"/> Middle <input type="checkbox"/> High ➢ Risk of torsion of the ankle <input type="checkbox"/> Low <input type="checkbox"/> Middle <input type="checkbox"/> High ➢ Irregularities of the surface (lack of flatness) <input type="checkbox"/> Low/Zero <input type="checkbox"/> Middle <input type="checkbox"/> High ➢ Other elements justifying this quotation:	➢ Risk of torsion of the ankle <input type="checkbox"/> Low <input type="checkbox"/> Middle <input type="checkbox"/> High ➢ Irregularities of the surface (lack of flatness) <input type="checkbox"/> Low <input type="checkbox"/> Middle <input type="checkbox"/> High ➢ Feeling of imbalance <input type="checkbox"/> Low <input type="checkbox"/> Middle <input type="checkbox"/> High ➢ Discomfort caused by joints (if cane, heels, ...) <input type="checkbox"/> Low <input type="checkbox"/> Middle <input type="checkbox"/> High ➢ Other elements justifying this quotation:

> 3 participants moving in a wheelchair

> 2 participants walking with a rollator

> 3 blind participants walking with a white cane

> 1 visually impaired participant walking with a white cane

> 1 visually impaired participant walking with a white cane and a guide dog

> 18 valid

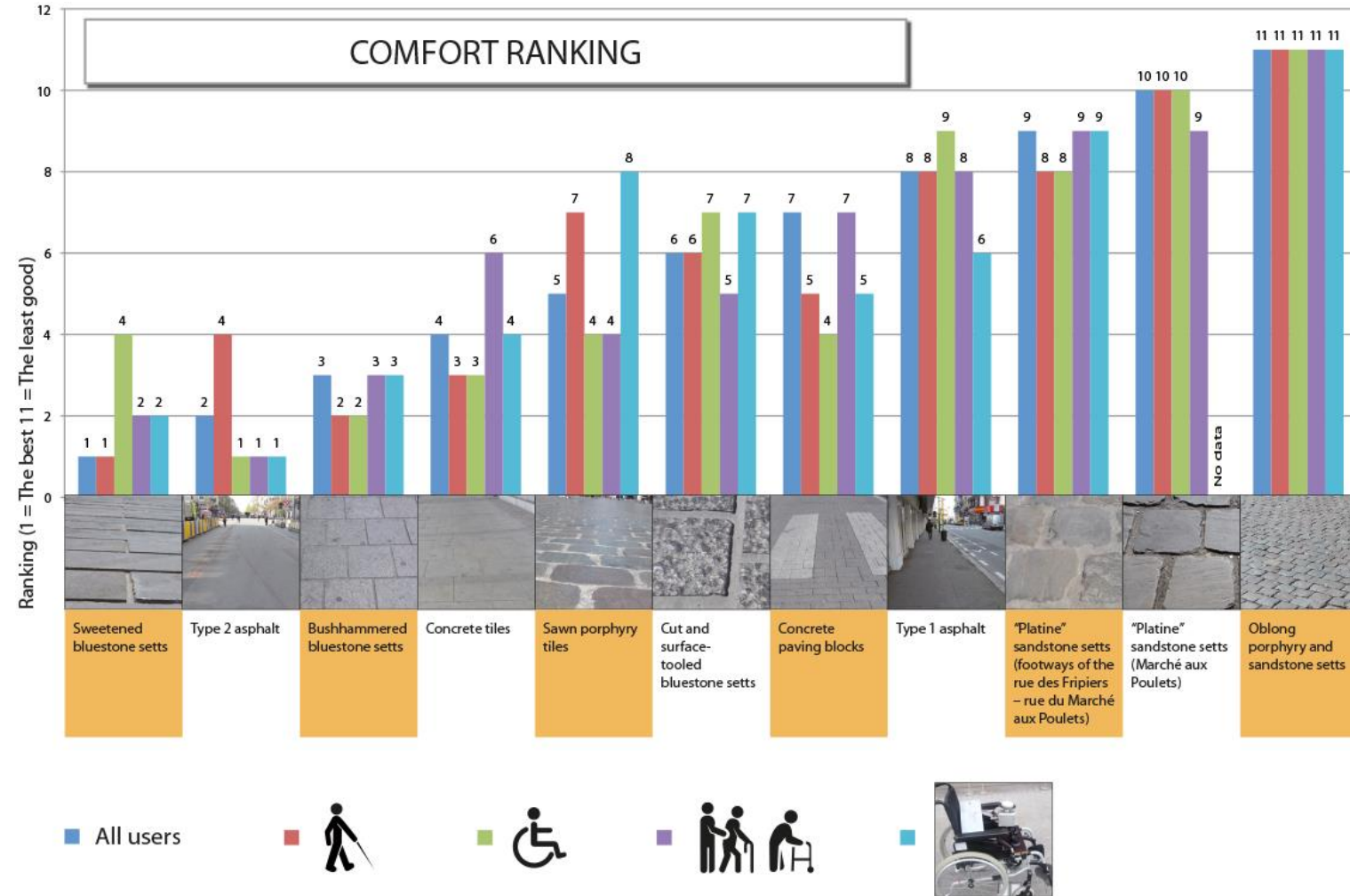
TOTAL: 28 participants

Briefing/debriefing



Results compared for 2 test sites

- No material dominates the ranking
- Variable classification between users
- Correlation between the results of the users and those of the chair : 0.78!



Developing a second prototype (2017)



- Full wheels
- Weight: 43 kg
- Speed: 1m/s



Correlation:
0.89!

Repeatability:
VG

2018: analysing the comfort and slip resistance of pedestrian pavements in the Brussels Capital Region

- Objective: to identify trends/categories of pavements according to their quality of use

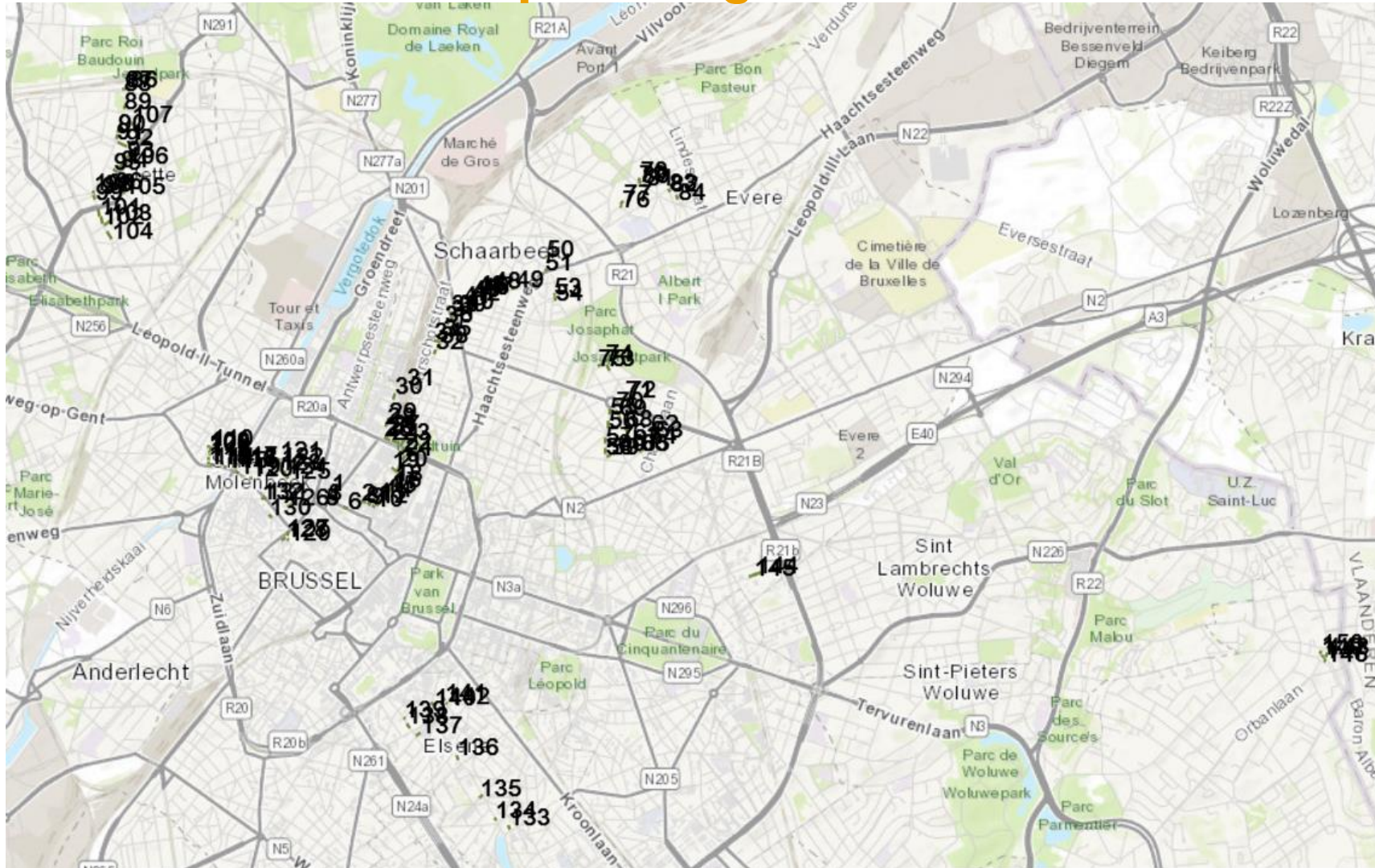


2018: analysing the comfort and slip resistance of pedestrian pavements in the Brussels Capital Region

154 pedestrian pavements measured → 300 sites today in the data bank

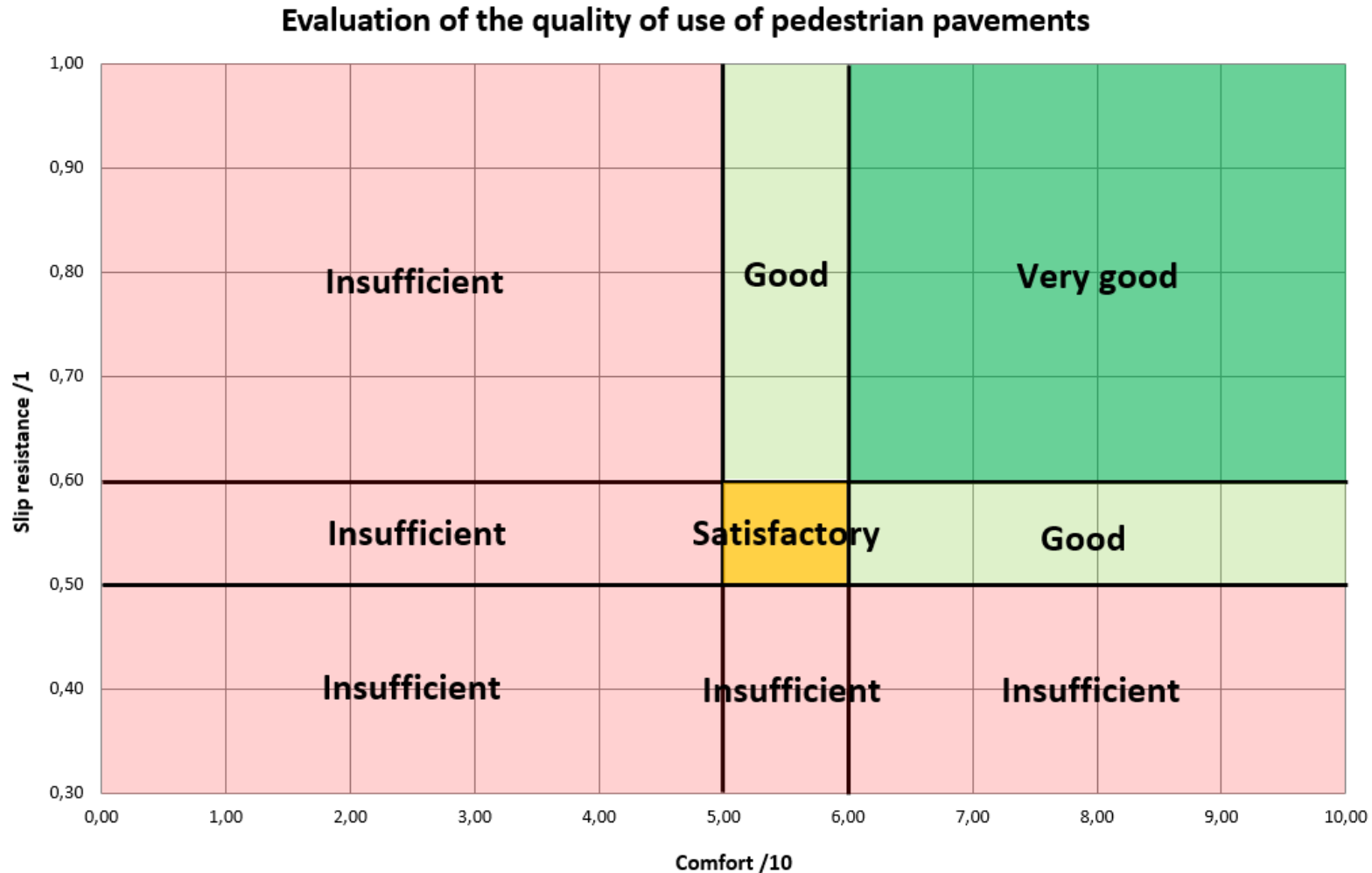
- Natural stone setts:
 - oblong setts (3)
 - 'platine' setts (30)
 - small setts ('mosaic paving') (2)
 - sawn blocks (9)
 - reworked rectangular setts (15)
 - reworked 'square' format tiles (11)
 - slabs (15)
- Concrete pavements:
 - paving blocks (34)
 - tiles (14)
 - slabs (14)
 - continuous concrete (1)
- Asphalt pavements (4)
- Wooden pavements (2)

2018: analysing the comfort and slip resistance of pedestrian pavements in the Brussels Capital Region



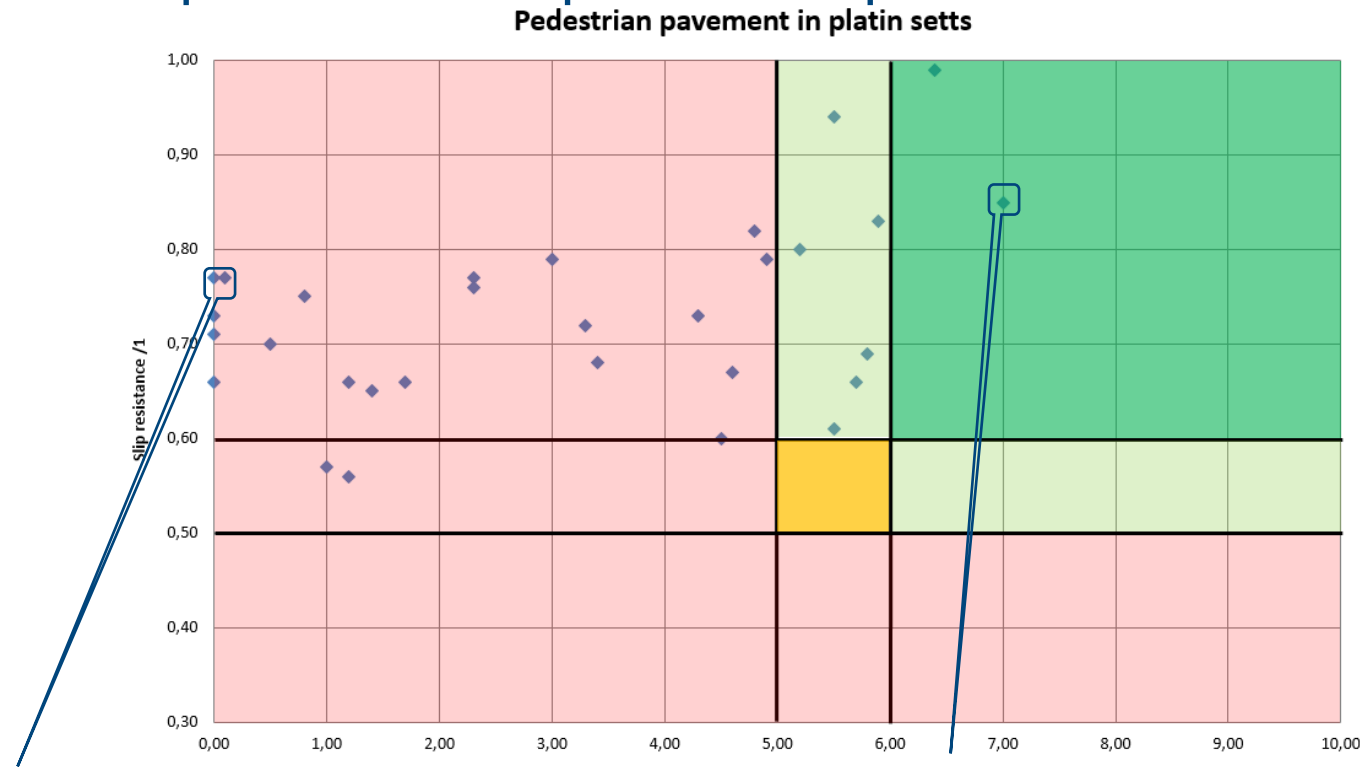
2018: analysing the comfort and slip resistance of pedestrian pavements in the Brussels Capital Region

Illustrative diagram of the quality of use of a pavement



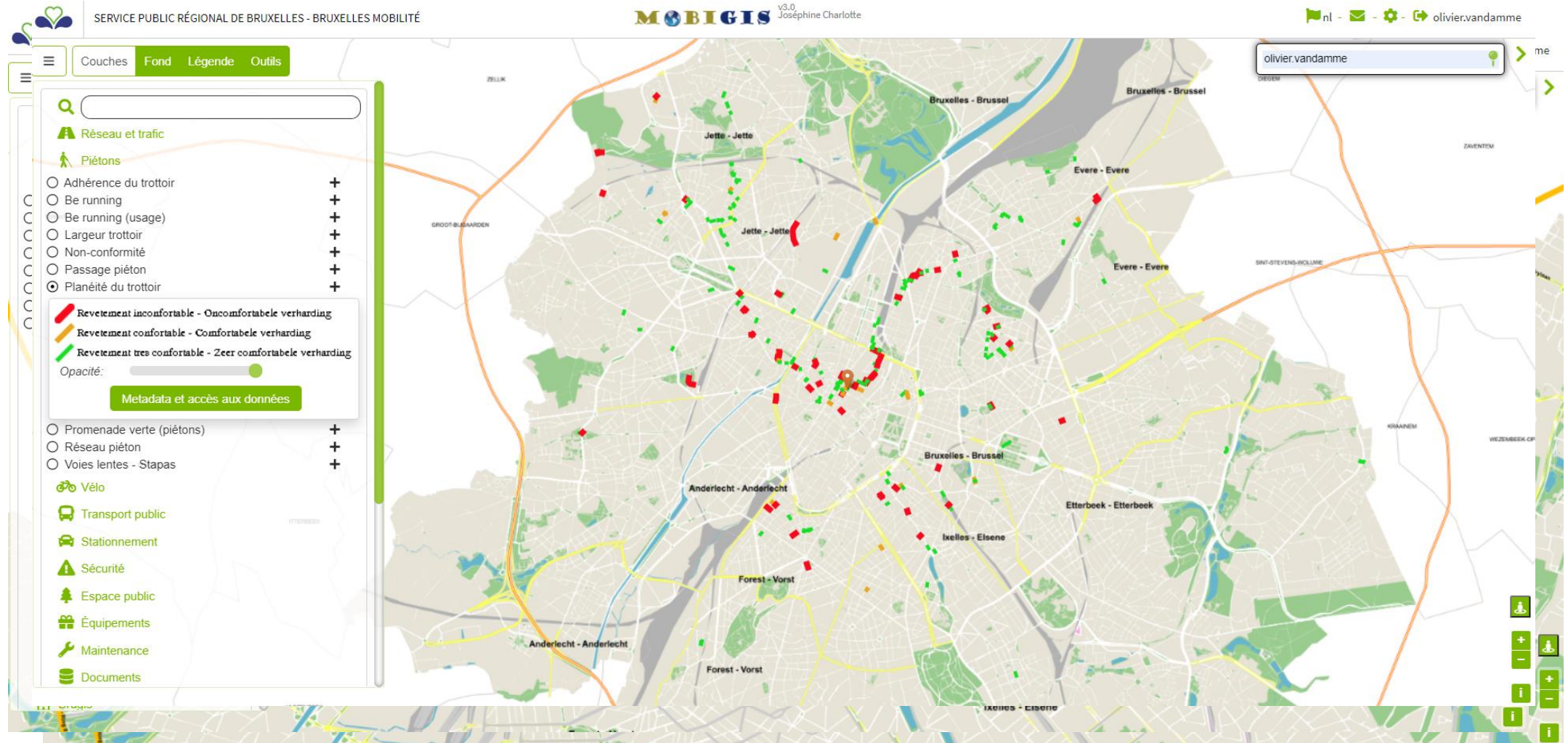
2018: analysing the comfort and slip resistance of pedestrian pavements in the Brussels Capital Region

Exemple of results: pedestrian pavement in natural stone

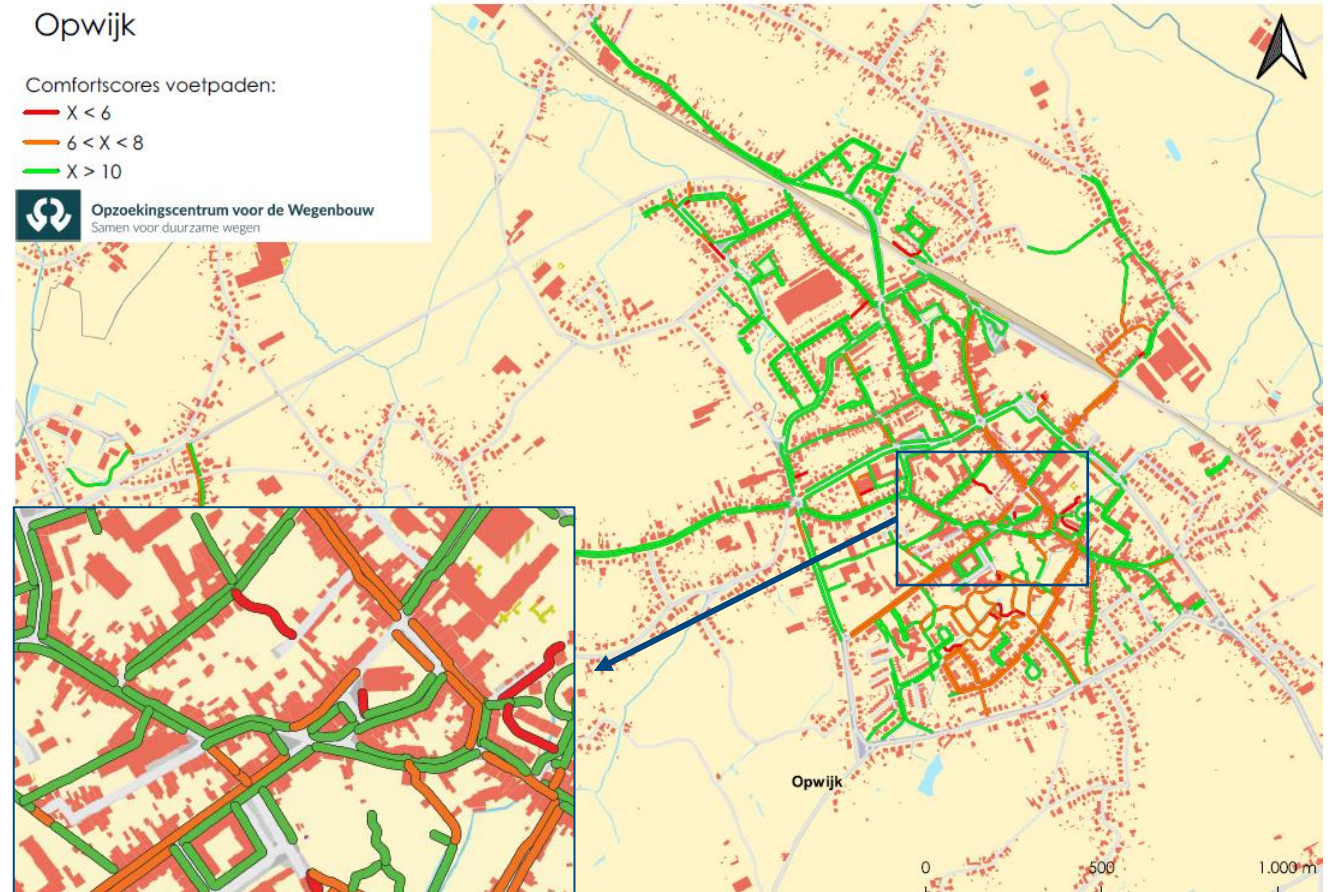
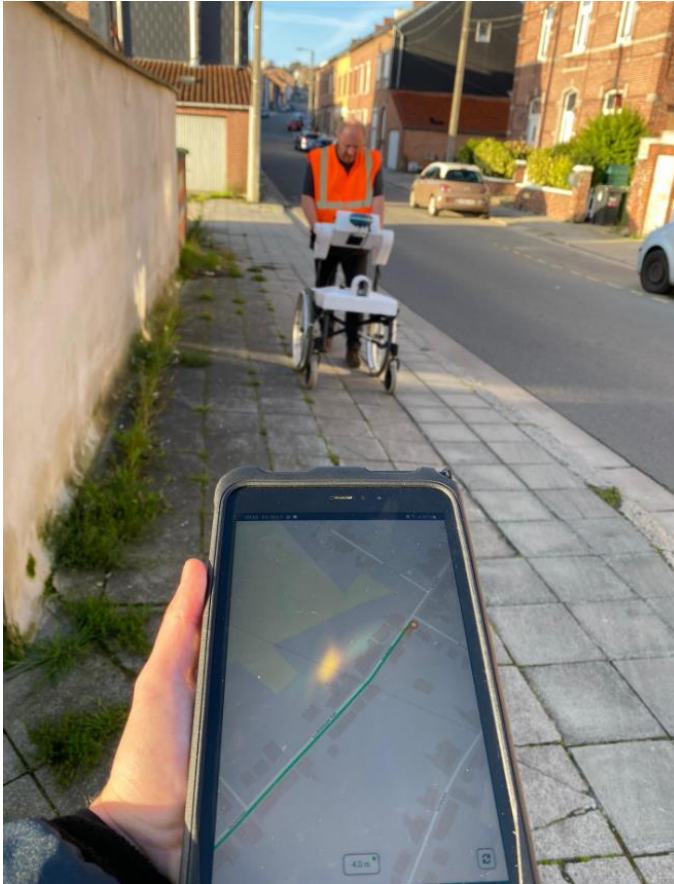


		Comfort /10 0,1			Comfort /10 7
Rue du Marais (15)		Slip r. /1 0,77	Rue Coosemans (64)		Slip r. /1 0,85

Data bank available on the geoportail of the Brussels Capital Region

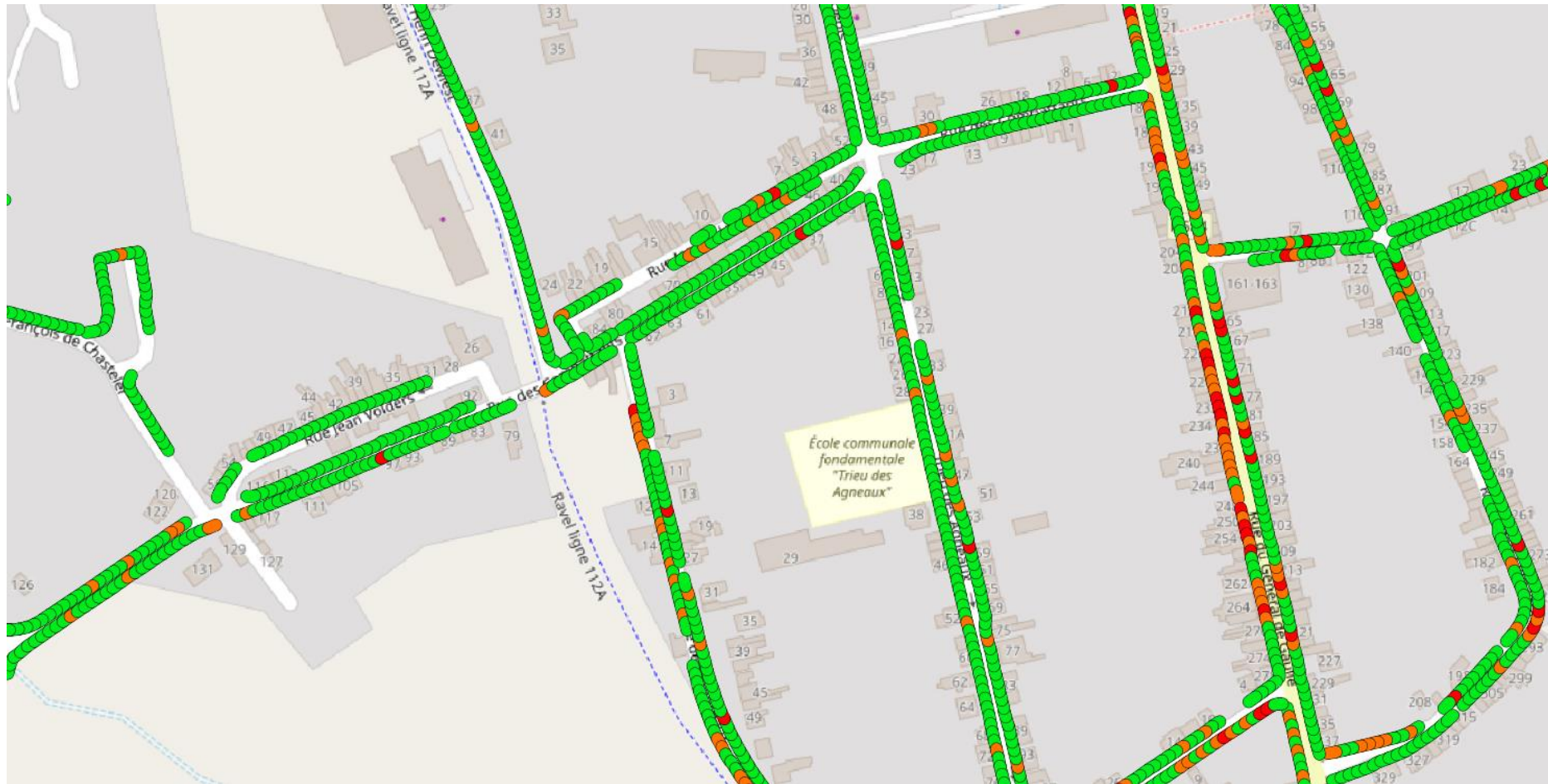


Campagne of measurement for a municipality network (Opwijk)



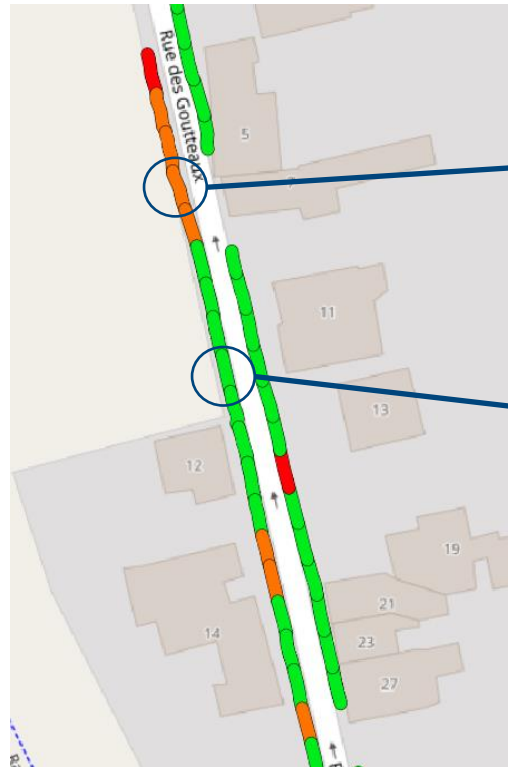
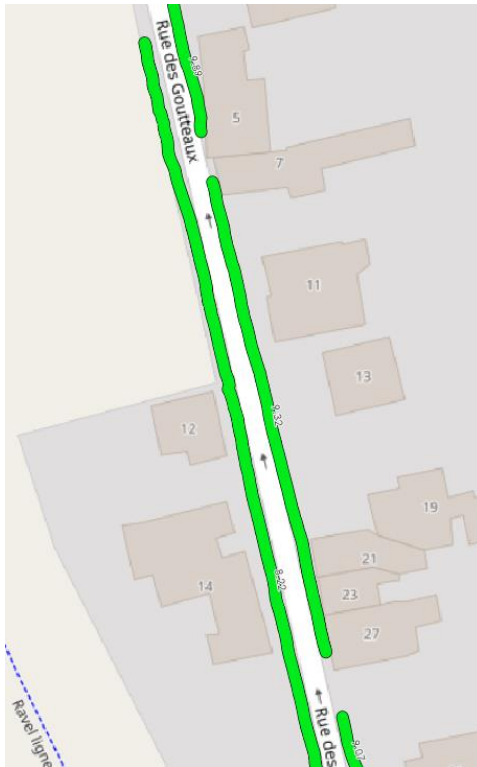
Campagne de measurement for a municipality network (Courcelles)

Results of confort measures by 5 meters section



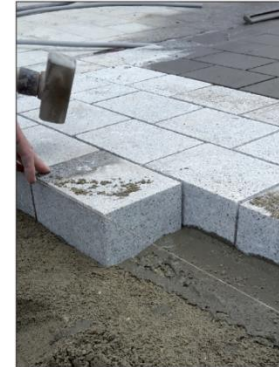
Campagne of measurement for a municipality network (Courcelles)

Exemple : Street des Goutteaux detail



Conclusions

- The new equipment (wheelchair with sensor) and the PFT tool make it possible to continuously assess the comfort and slip resistance of pedestrian pavements
- Some 'pedestrian' pavements laid in public spaces do not provide all users with optimum quality of use!
- Natural stone is not incompatible with pedestrian use, but requires special attention when:
 - choosing the type of stone (evenness and surface finish)
 - laying (e.g. joints)
- Drafting a charter on pedestrian pavements in the Brussels Capital Region



Thank you for your attention!



Wanda DEBAUCHE

Belgian Road Research Center

w.debauche@brrc.be



@PIARC_Roads



World Road
Association PIARC



World Road
Association PIARC



World Road
Association PIARC

www.piarc.org

