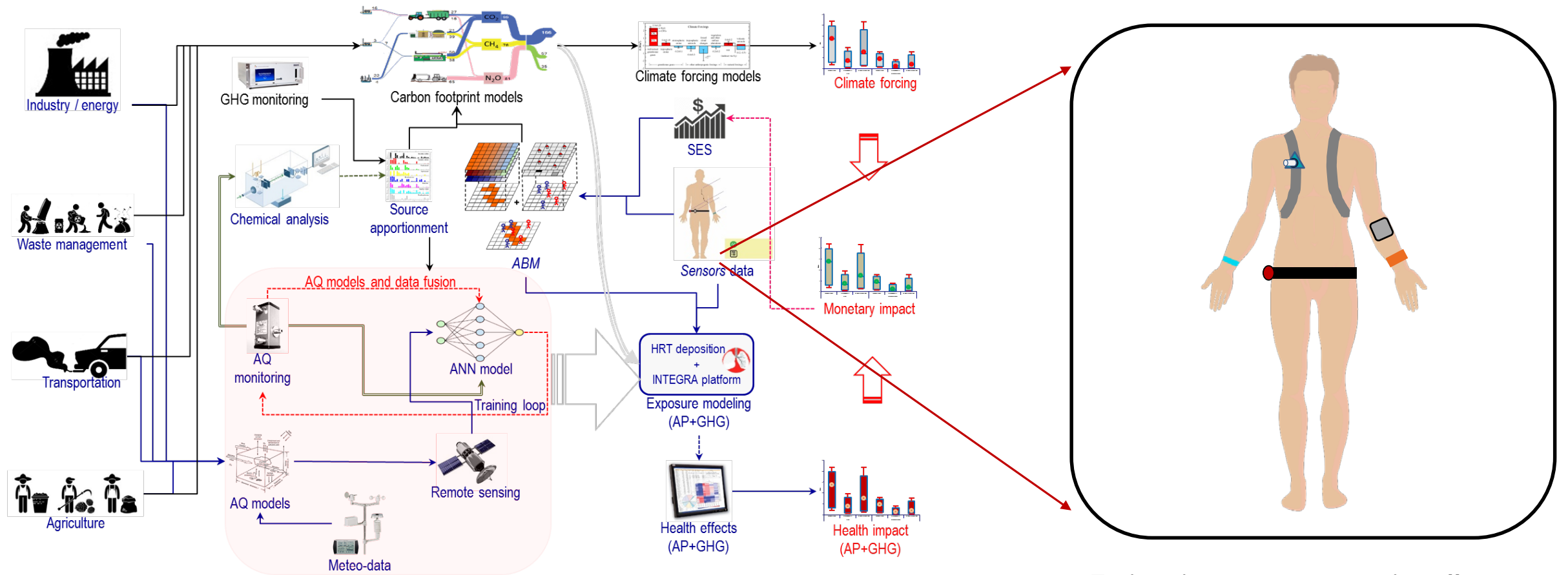




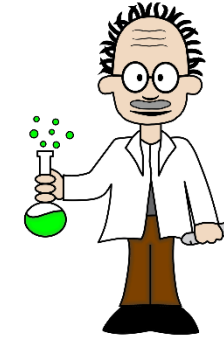
# Multi-sensor data collection for personal exposure monitoring: ICARUS experience

***David Kocman, Tjaša Kanduč, Rok Novak, Johanna A. Robinson, Ondrej Mikeš, Celine Degrendele, O. Sanka, J. Vinkler, R. Prokeš, Danielle Vienneau, Benjamin Flückiger, Alberto Gotti, J. Visave, F. Bugnoni, Marco G. Persico, Saul Garcia Dos Santos, B. Nuñez-Corcuera, Thomas Magos, A. Stamatelopoulou, D. Pardali, D. Saraga, Dimitris Chapizanis, I. Petridis, S. Karakitsios, E. Boldo, R. Izquierdo, G. Sarigiannis, Denis A Sarigiannis***



Estimating exposure to air pollutants using new monitoring approaches

- Parameters measured
- Portability
- Reliability of captured data
- Cost
- Data collection and transfer protocols / GDPR

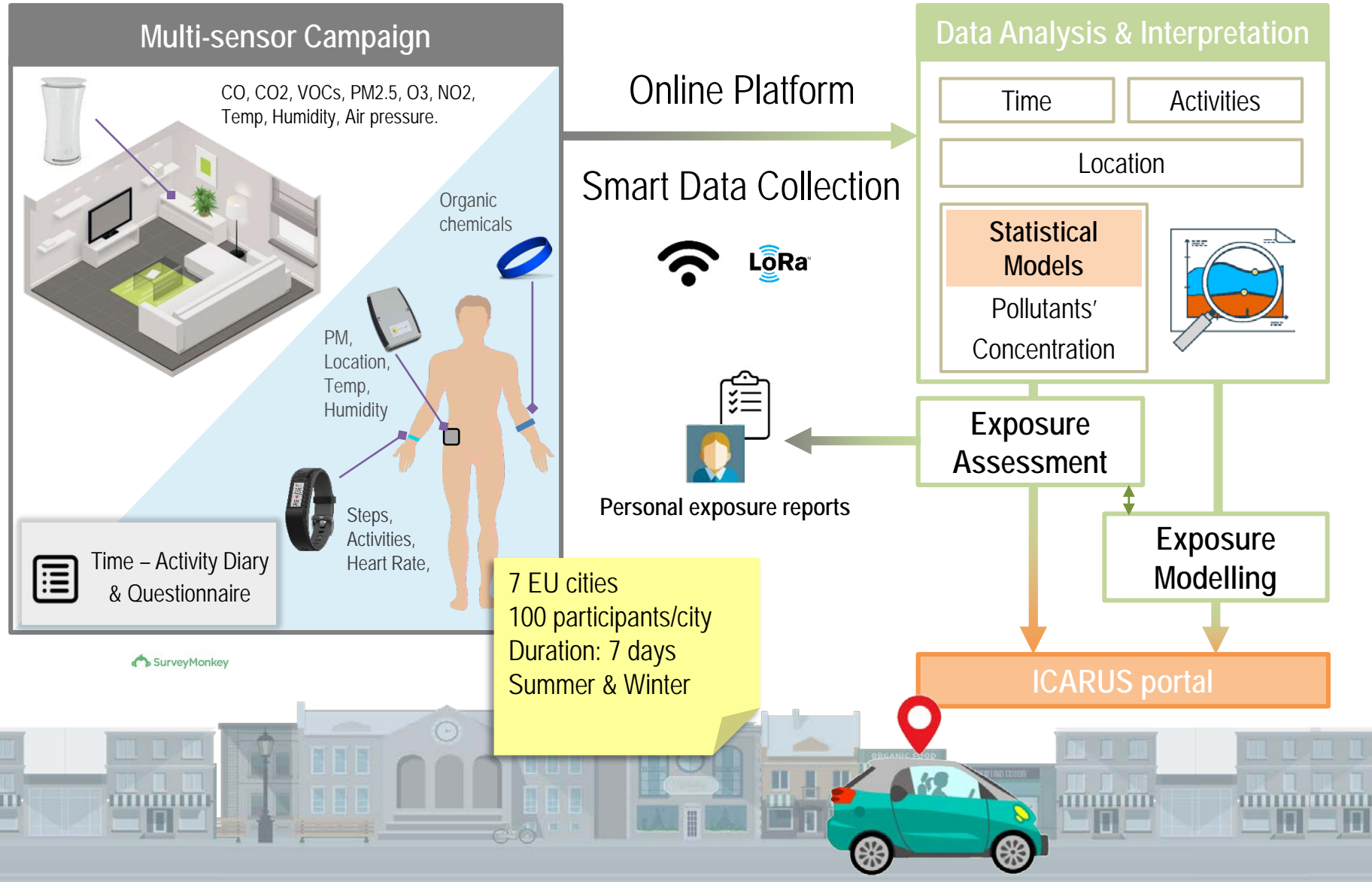


- Unobtrusive to the wearer
- User-friendliness



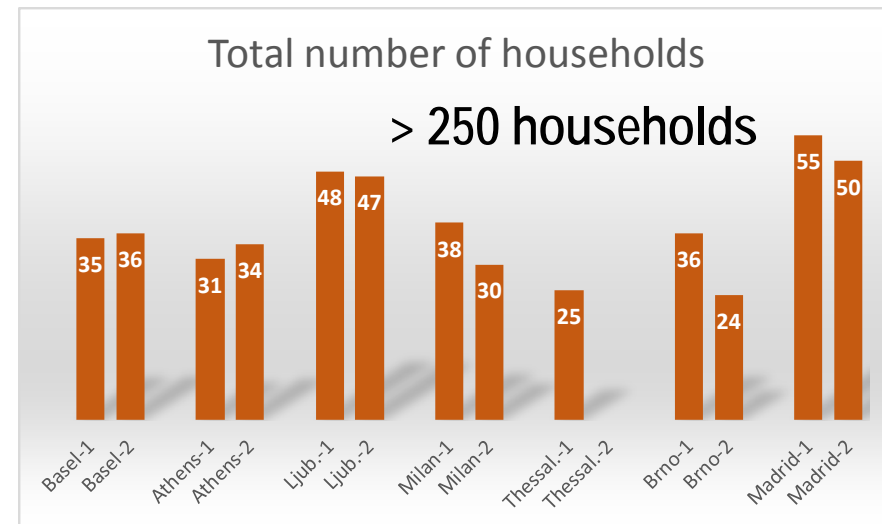
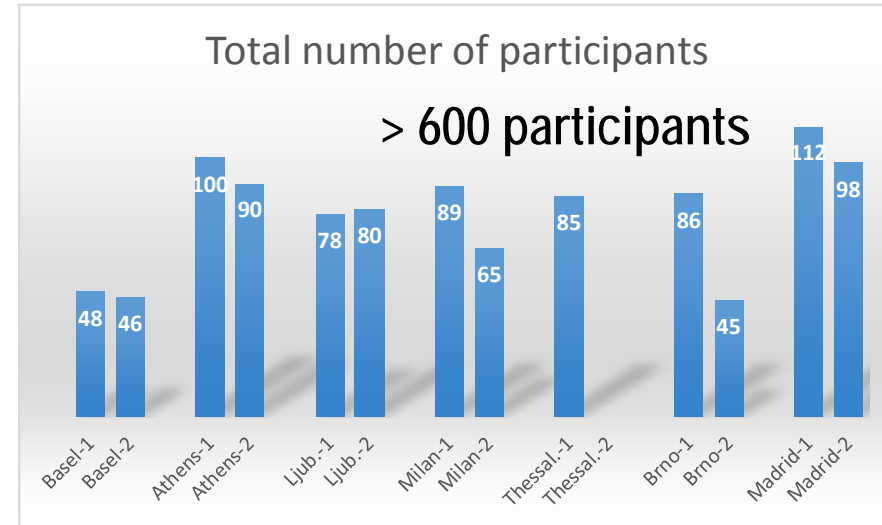
- Citizens become aware of the effects of their lifestyle choices





- Exposure assessment at individual level (*location, activity, AQ in microenvironment*)
- Support/validation of models
- User experience

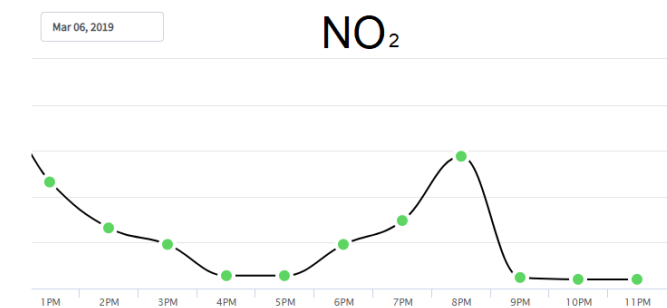
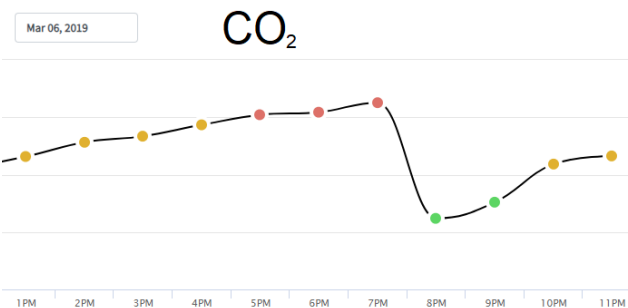
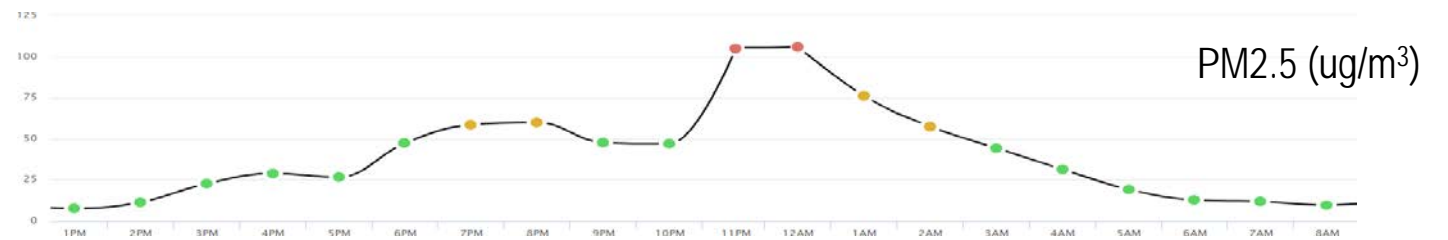
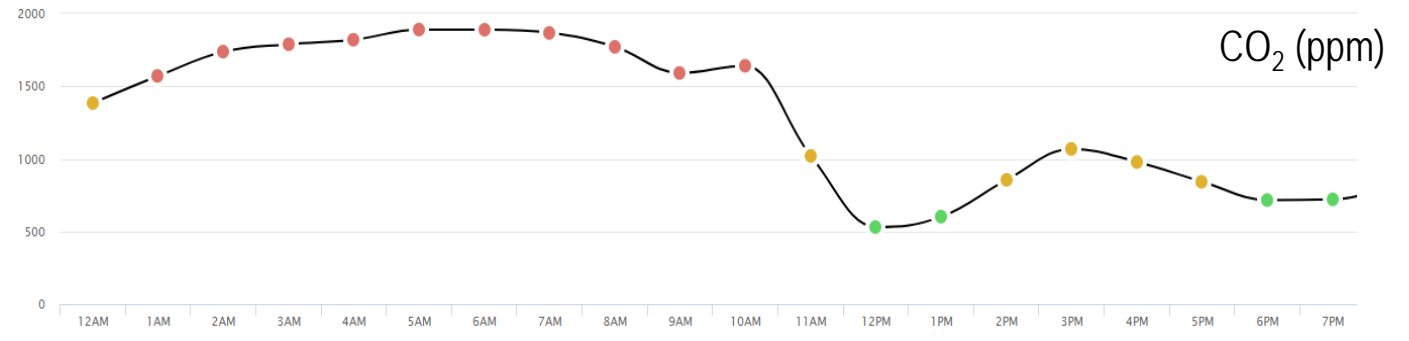






**7 cities => over 150 mio records**

- **Insufficient ventilation**  
*(independent of the system)*
- **Increased values of pollutants linked to a few short-term daily events**  
*(e.g. cooking, heating)*
- **Time and duration of ventilation** *(depending on activity and location)*

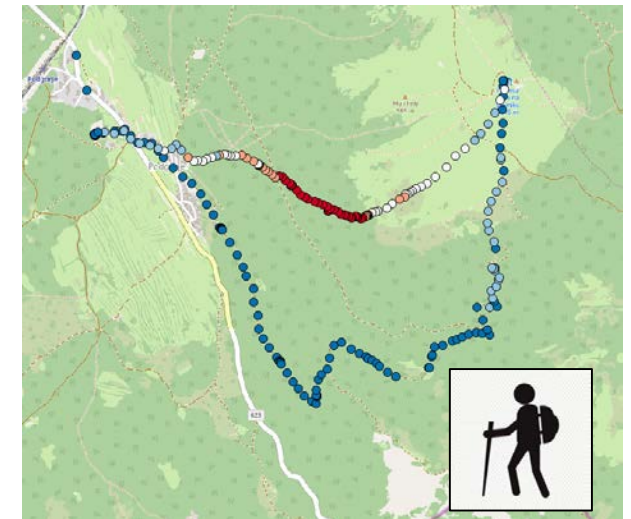
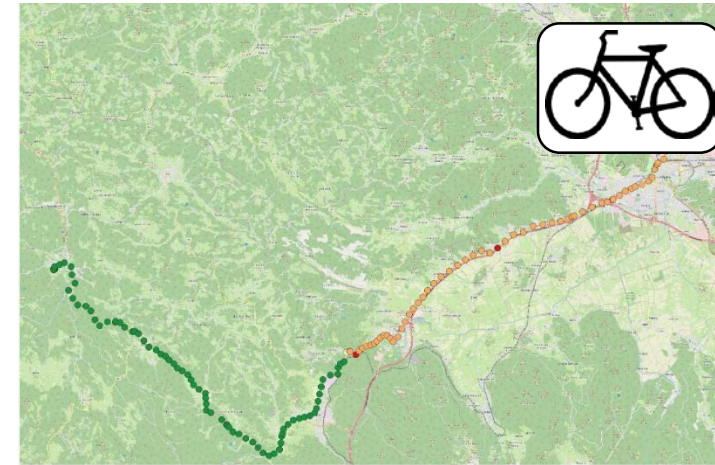




## – The monotony of the living space



## – AQ & outdoor activity

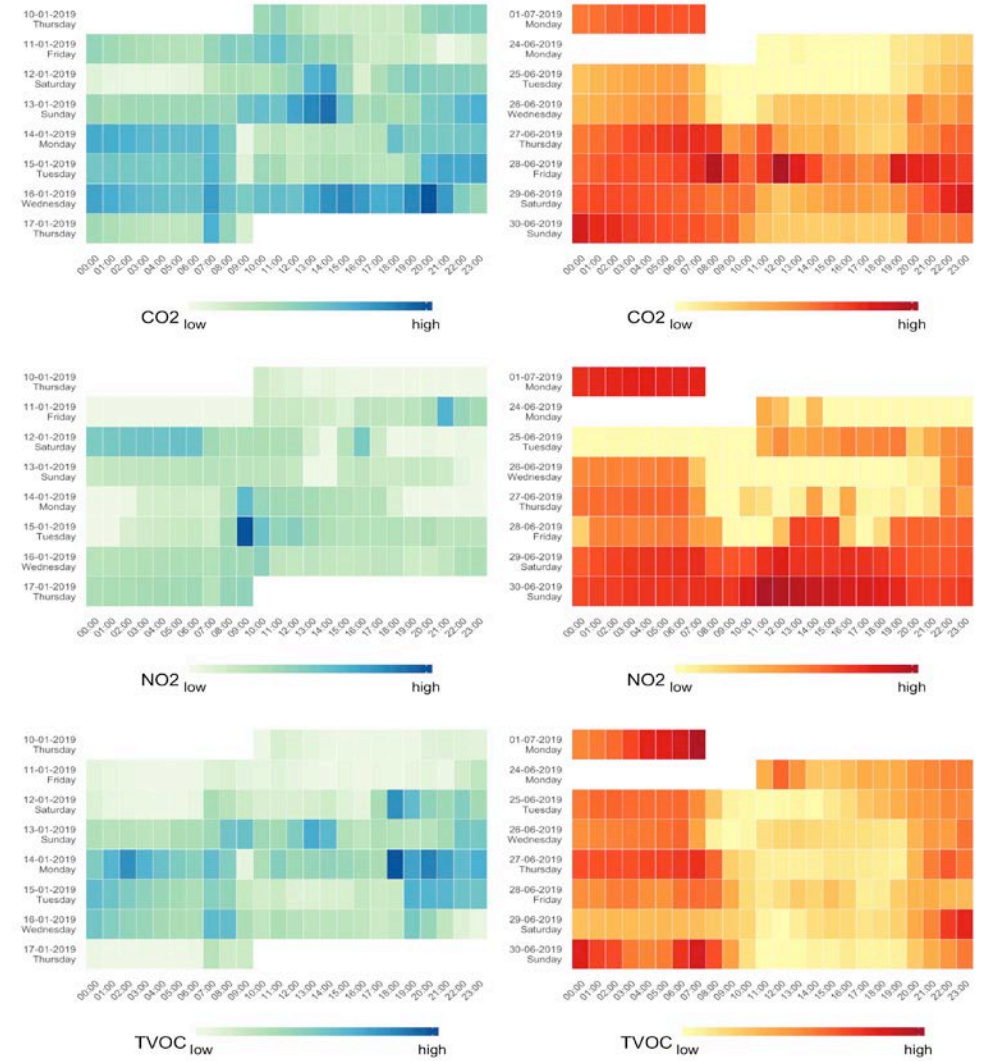
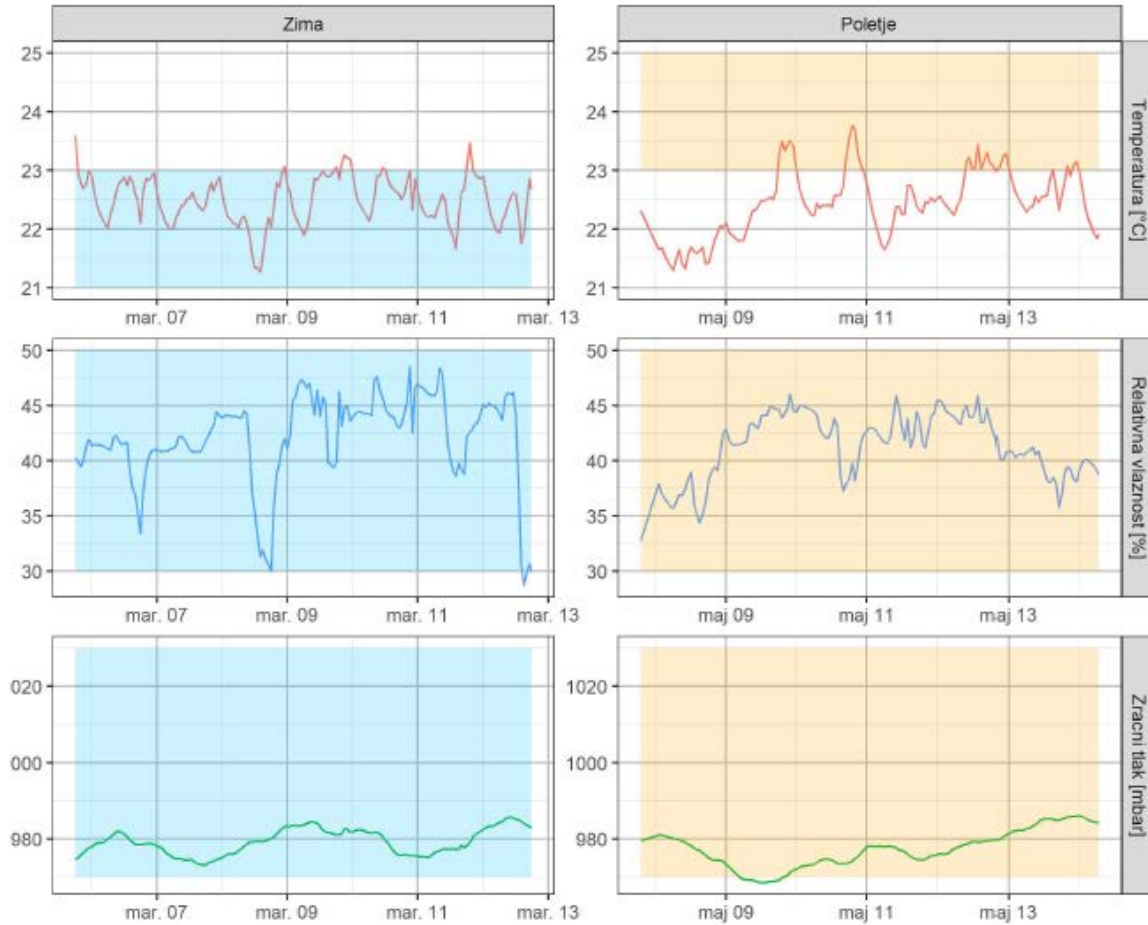


Time step		ICARUS PM sensor				Garmin					TAD									
		1min	1min	1min	1min	1min	1min	15sec	15min	15min	1h	1h	1h							
00:00:15	00:01	PM1 PM2.5 PM10	Temp	Hum	Coordinates	Steps	Distance	Heart rate	Type of activity	Intensity of activity	01:00	Type of Location	Type of Activity	Household Conditions						
00:00:30								ug/m3							°C	%	Latitude Longitude	count	meters	
00:00:45																				
00:01:00																				
00:01:15	00:02	...	...	...	...	...	...	...	...	e.g. Sleeping, Walking, Running, Swimming,					e.g. Sedentary, Active, Highly-active,	e.g. Indoors, Outdoors, In transit,  Home, Office	e.g. Sleeping, Walking, Running, Swimming,	e.g. Windows ON/OFF, AC ON/OFF		
00:01:30																				
00:01:45																				
00:02:00																				
	00:03	00:15	...	...	...	...	...	...	...	...					...	...	...	...	...	
	00:04																			
	00:05																			
	...																			
00:14:15	00:15	...	...	...	...	...	...	...	...	...					...	...	...	...	...	
00:14:30																				
00:14:45																				
00:15:00																				

- Personal exposure and activities information at 1min step

## Considerations....

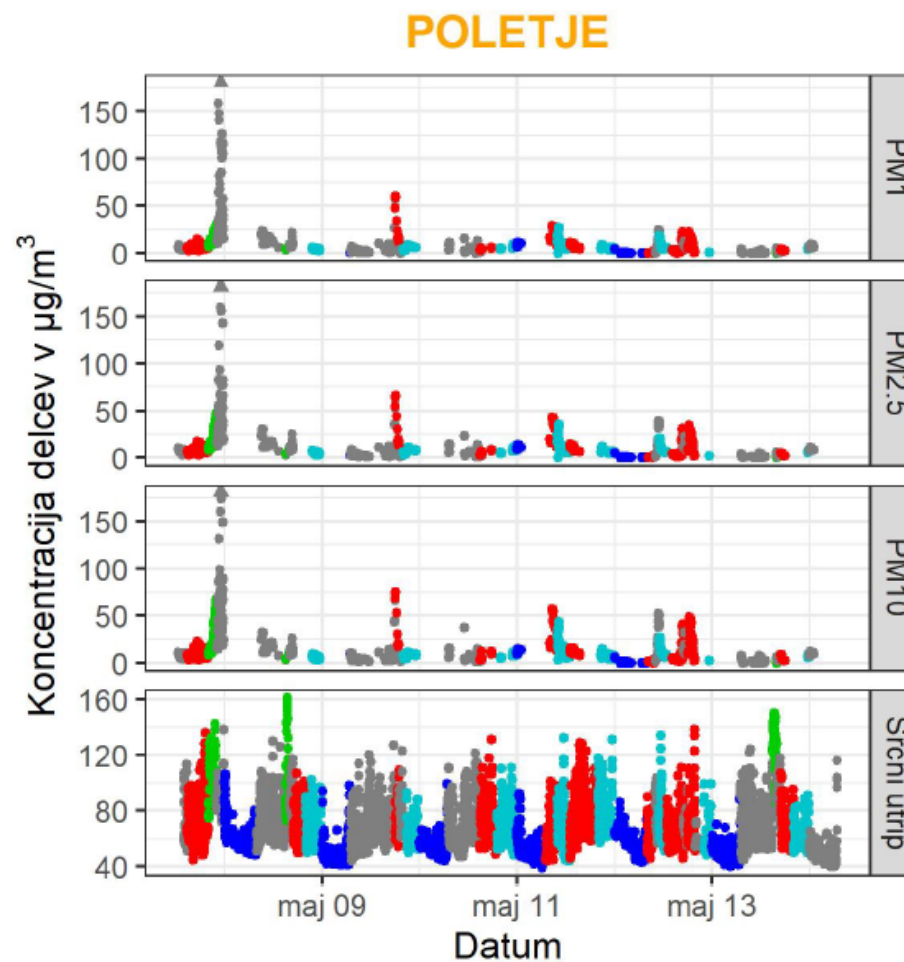
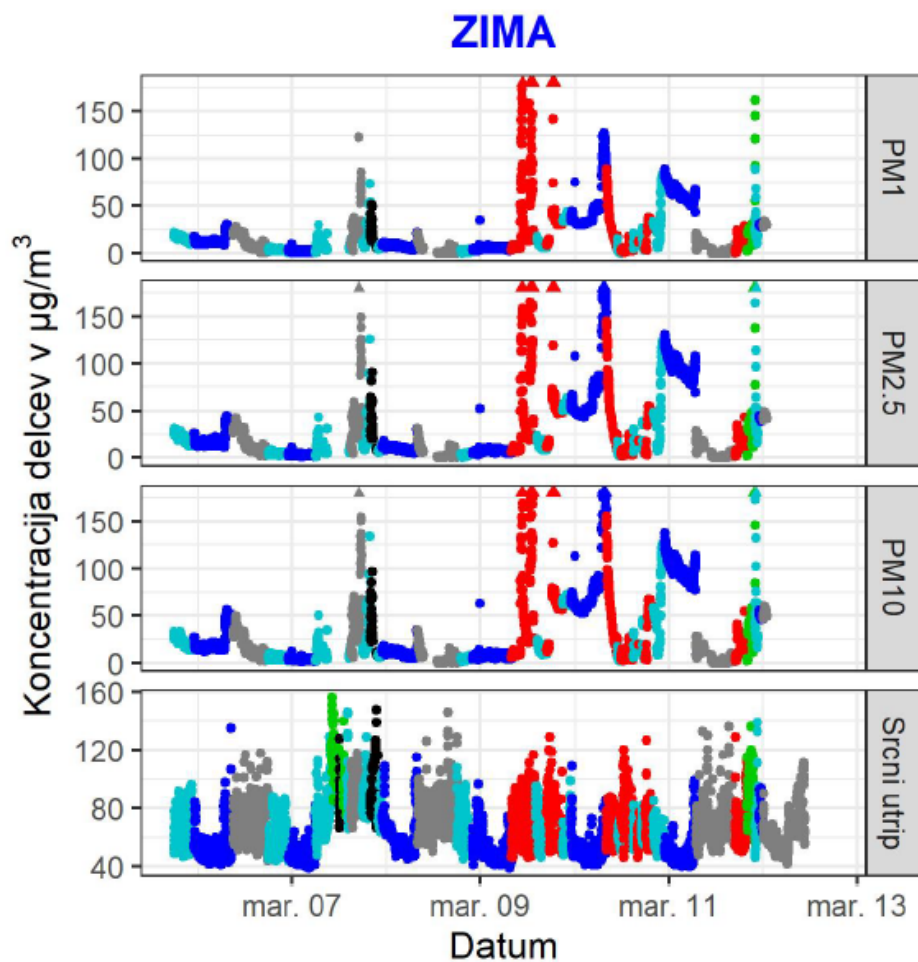
- *Uncertainties related to data coming from low-cost sensing devices (clear explanation/disclaimer)*
- *We must assume that the **user is a layman** in terms of air pollution and its impact on health.*
- *Report must be **brief and concise**. Too much information creates distraction*

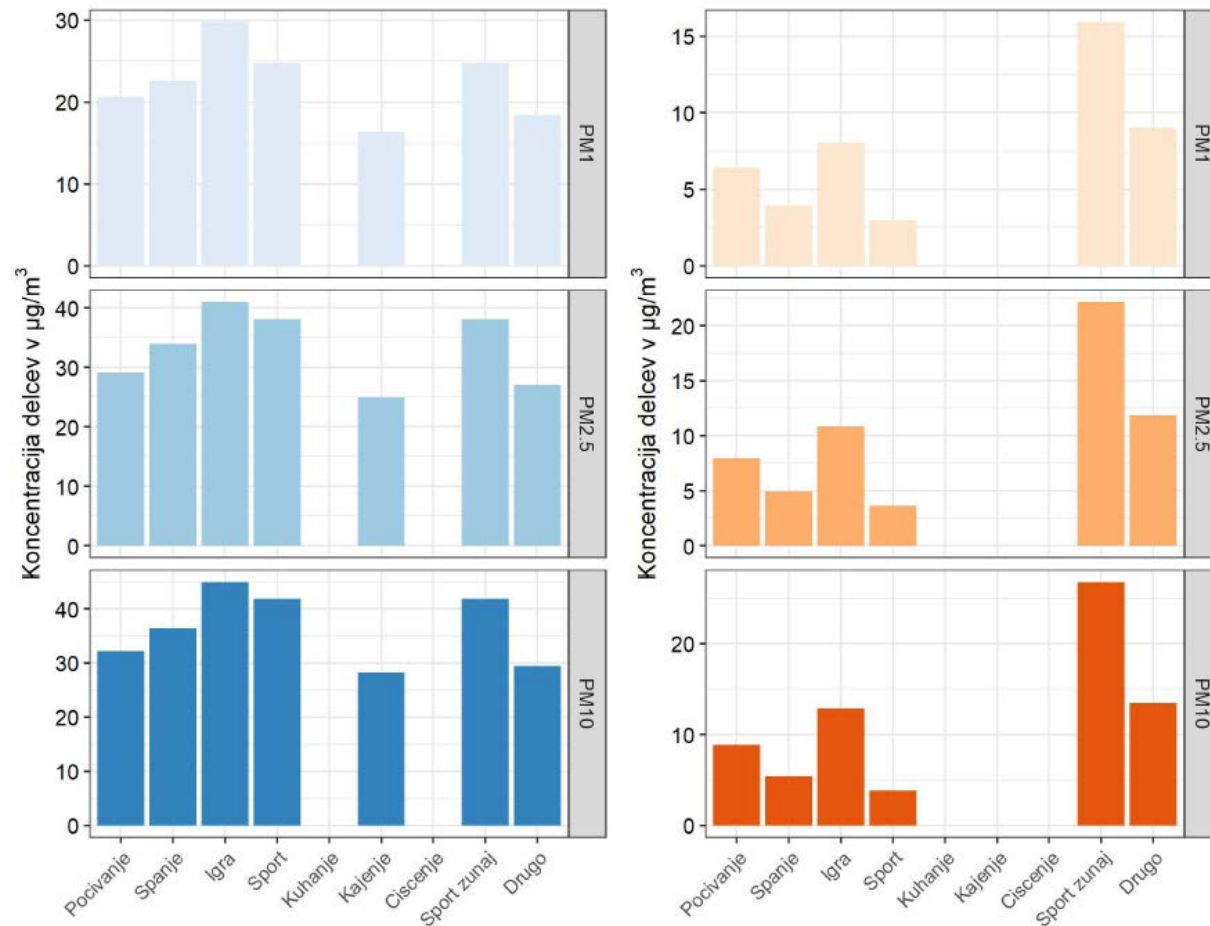
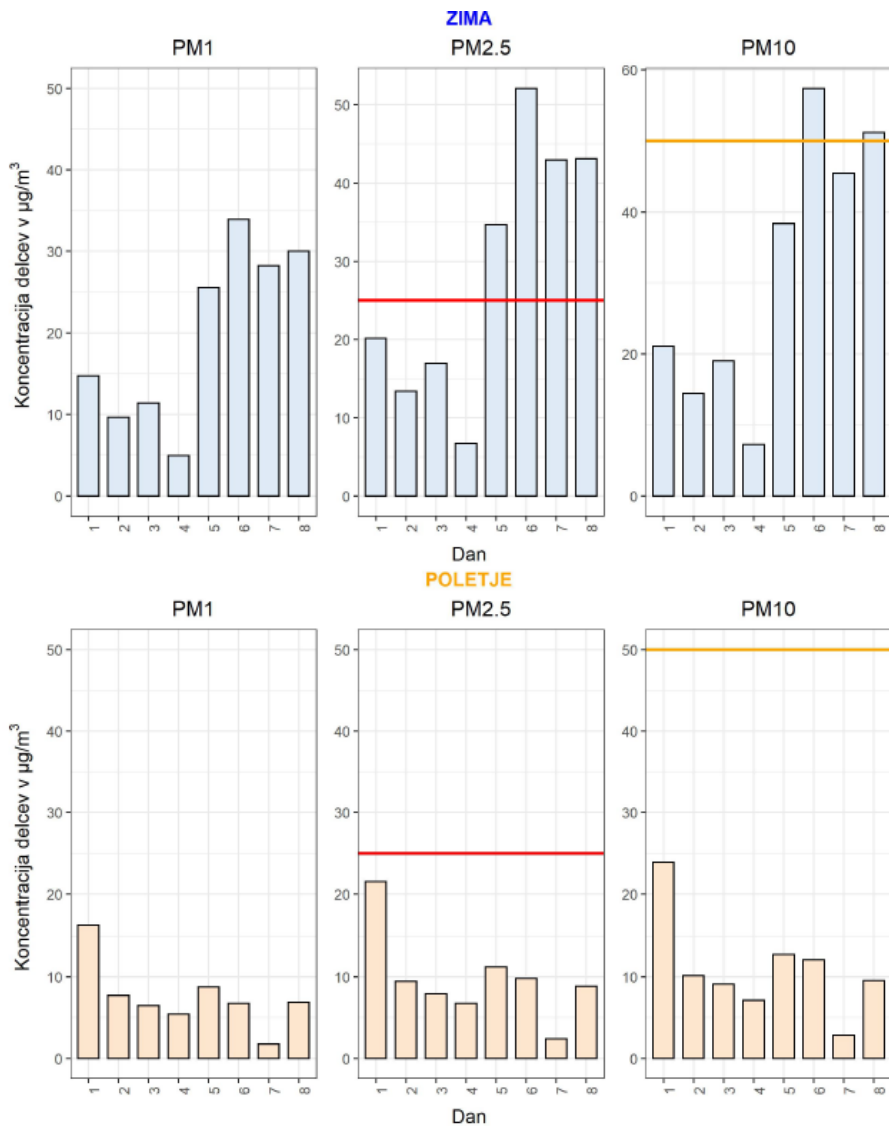




Aktivnost

- Neznana aktivnost
- Kuhanje
- Ciscenje
- Igranje
- Tek
- Spanje
- Pocivanje
- Kajenje
- Sport







- ✓ Really satisfied about the way the study was organised
  - ✓ Participants actively shared pictures on social media
  - ✓ Interested in getting back results / personal reports
  - ✓ Duration of the study was fine
  - ✓ Very satisfied with the wearing and using of the Garmin device.
  - ✓ Especially children were very excited to participate in the study.
- The custom-built PM sensor was well accepted. Only a few complaints about its size
- In a few cases, participants forgot to charge the PM sensor and/or to carry the PM sensor with them.
  - TAD: time consuming and difficult to be filled out (e.g. for activities with small duration).
  - Two cases of allergic reaction (skin rash) due to nickel in the Garmin-device (Basel)





ICARUS



H2020-SC5-2015 - GA: 90105

**Thank you very much  
for your kind attention!**