European Network on New Sensing Technologies for Air Pollution Control and Environmental Sustainability - *EuNetAir*

COST Action TD1105

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New Trends and Challenges for Air Quality Control

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Making visible the invisible: communicating air quality

Nuria Castell

MC Member / ncb@nilu.no

NILU – Norwegian Institute for Air Research / Norway

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Making visible the invisible: communicating air quality

N. Castell[1], J. Noll[2], S. Fayyad[2], M.F. Fredriksen[1], P. Shcneider[1], H.Y. Liu[1], W. Lahoz[1]

[1]*NILU-Norwegian Institute for Air Research, Norway; ncb@nilu.no*

[2]*UNIK, Norway, josef@unik.no*

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Clean air is a basic requirement for human health and well-being

Air pollution continues to pose a significant threat to health worldwide

Air pollution and lung cancer incidence in 17 European cohorts: prospective analyses from the European Study of Cohorts for Air Pollution Effects (ESCAPE)

Ole Raaschou-Nielsen, Zorana J Andersen, Rob Beelen, Evangelia Samoli, Massimo Stafoggia, Gudrun Weinmayr, Barbara Hoffmann, Paul Fischer, Mark J Nieuwenhuijsen, Bert Brunekreef, Wei W Xun, Klea Katsouyanni, Konstantina Dimakopoulou, Johan Sommar, Bertil Forsberg, Lars Modig, Anna Oudin, Bente Oftedal, Per E Schwarze, Per Nafstad, Ulf De Faire, Nancy L Pedersen, Claes-Göran Östenson, Laura Fratiglioni, Johanna Penell, Michal Korek, Göran Pershagen, Kirsten T Eriksen, Mette Sørensen, Anne Tjønneland, Thomas Ellermann, Marloes Eeftens, Petra H Peeters, Kees Meliefste, Meng Wang, Bas Bueno-de-Mesquita, Timothy J Key, Kees de Hoogh, Hans Concin, Gabriele Nagel, Alice Vilier, Sara Grioni, Vittorio Krogh, Ming-Yi Tsai, Fulvio Ricceri, Carlotta Sacerdote, Claudia Galassi, Enrica Migliore, Andrea Ranzi, Giulia Cesaroni, Chiara Badaloni, Francesco Forastiere, Ibon Tamayo, Pilar Amiano, Miren Dorronsoro, Antonia Trichopoulou, Christina Bamia, Paolo Vineis, Gerard Hoek**

Summary

Background Ambient air pollution is suspected to cause lung cancer. We aimed to assess the association between long-term exposure to ambient air pollution and lung cancer incidence in European populations.

Chronic effects of air pollution on respiratory health in Southern California children: findings from the Southern California Children's Health Study

Zhanghua Chen[1], Muhammad T. Salam[1], Sandrah P. Eckel[2], Carrie V. Breton[1], Frank D. Gilliland[1]

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Reducing the personal exposure to air pollution will decrease the likelihood of experiencing health problems associated with air pollution and lower the number of air pollution-related deaths

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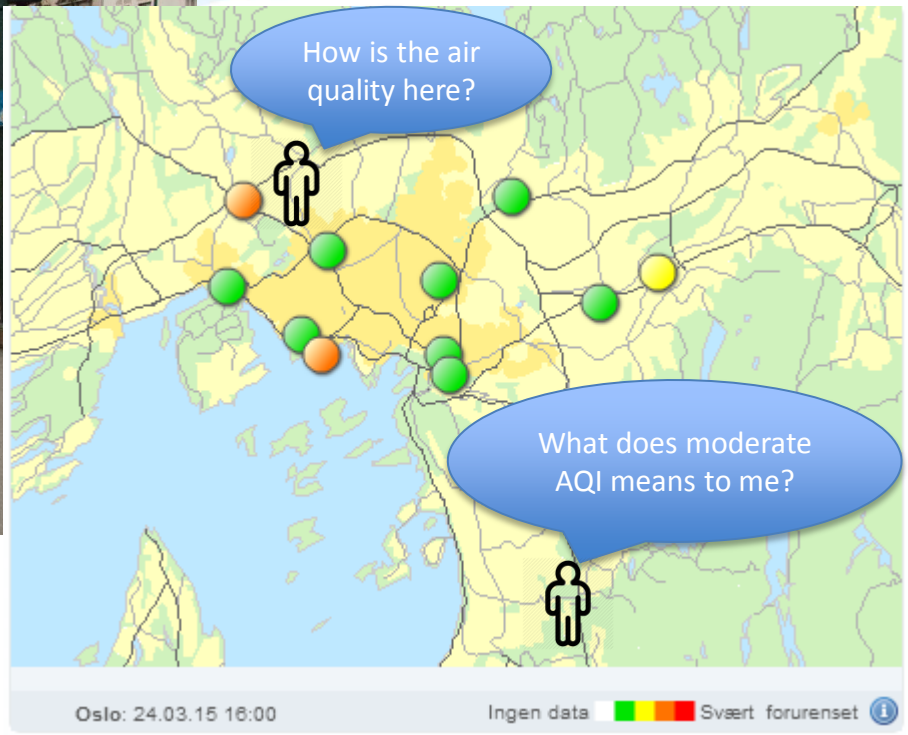
What information is available to the public?

Information from air quality monitoring stations



- ✓ No information at street level
- ✓ No information where the person is

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More and more information from low-cost sensors

- ✓ High temporal and spatial resolution map
- ✓ Information at street level
- ✓ Information where the person is

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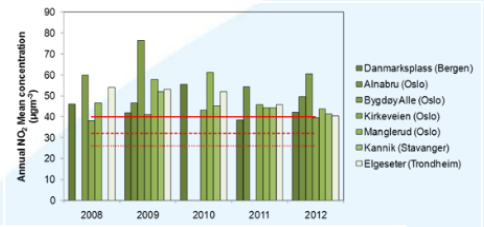
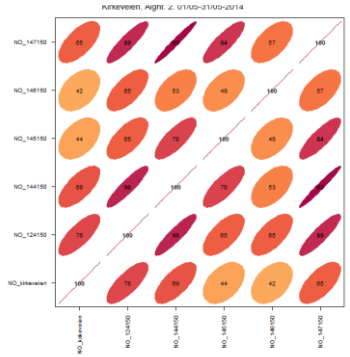
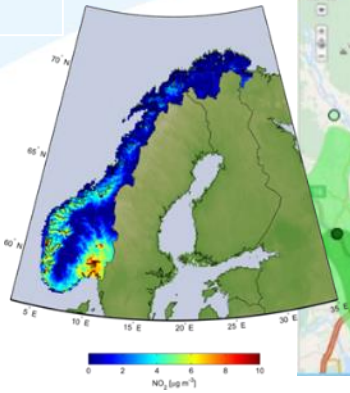
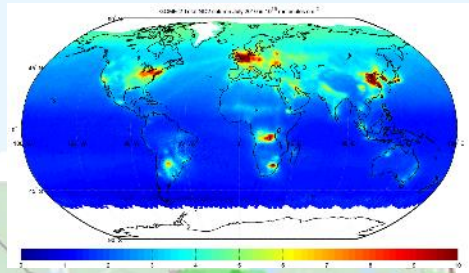
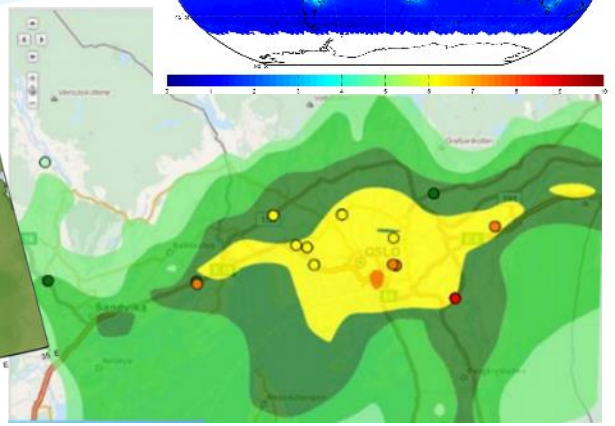
How can we visualize the information in a way that is useful and easy to understand by the general public?











Scientific data ⟷ Non-scientist

It is necessary that the public understands the air quality information

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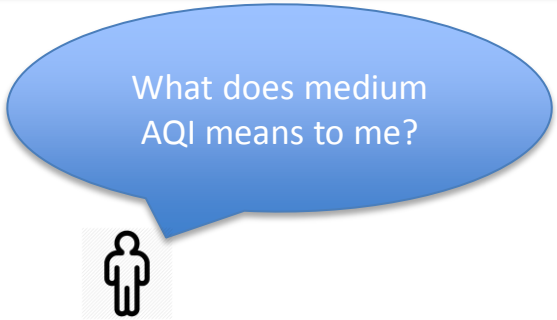
AIR QUALITY INDEX

- Common way of visualizing air quality
- Inconsistent between countries
- No easy relation with health effects

Common air quality index calculation grid

Index Class	Grid	ROADSIDE INDEX						BACKGROUND INDEX							
		Mandatory pollutant			Auxiliary pollutant			Mandatory pollutant				Auxiliary pollutant			
			PM10		PM2.5				PM10			PM2.5			
		NO2	1 hour	24 hours	1 hour	24 hours	CO	NO2	1 hour	24 hours	O3	1 hour	24 hours	CO	SO2
Very High	>100	>400	>180	>100	>110	>60	>20000	>400	>180	>100	>240	>110	>60	>20000	>500
High	100	400	180	100	110	60	20000	400	180	100	240	110	60	20000	500
	75	200	90	50	55	30	10000	200	90	50	180	55	30	10000	350
Medium	75	200	90	50	55	30	10000	200	90	50	180	55	30	10000	350
	50	100	50	30	30	20	7500	100	50	30	120	30	20	7500	100
Low	50	100	50	30	30	20	7500	100	50	30	120	30	20	7500	100
	25	50	25	15	15	10	5000	50	25	15	60	15	10	5000	50
Very Low	25	50	25	15	15	10	5000	50	25	15	60	15	10	5000	50
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

- NO2, O3, SO2: hourly value / maximum hourly value in µg/m3
- PM10, PM2.5: hourly value / maximum hourly value or adjusted daily average in µg/m3
- CO: 8 hours moving average / maximum 8 hours moving average in µg/m3



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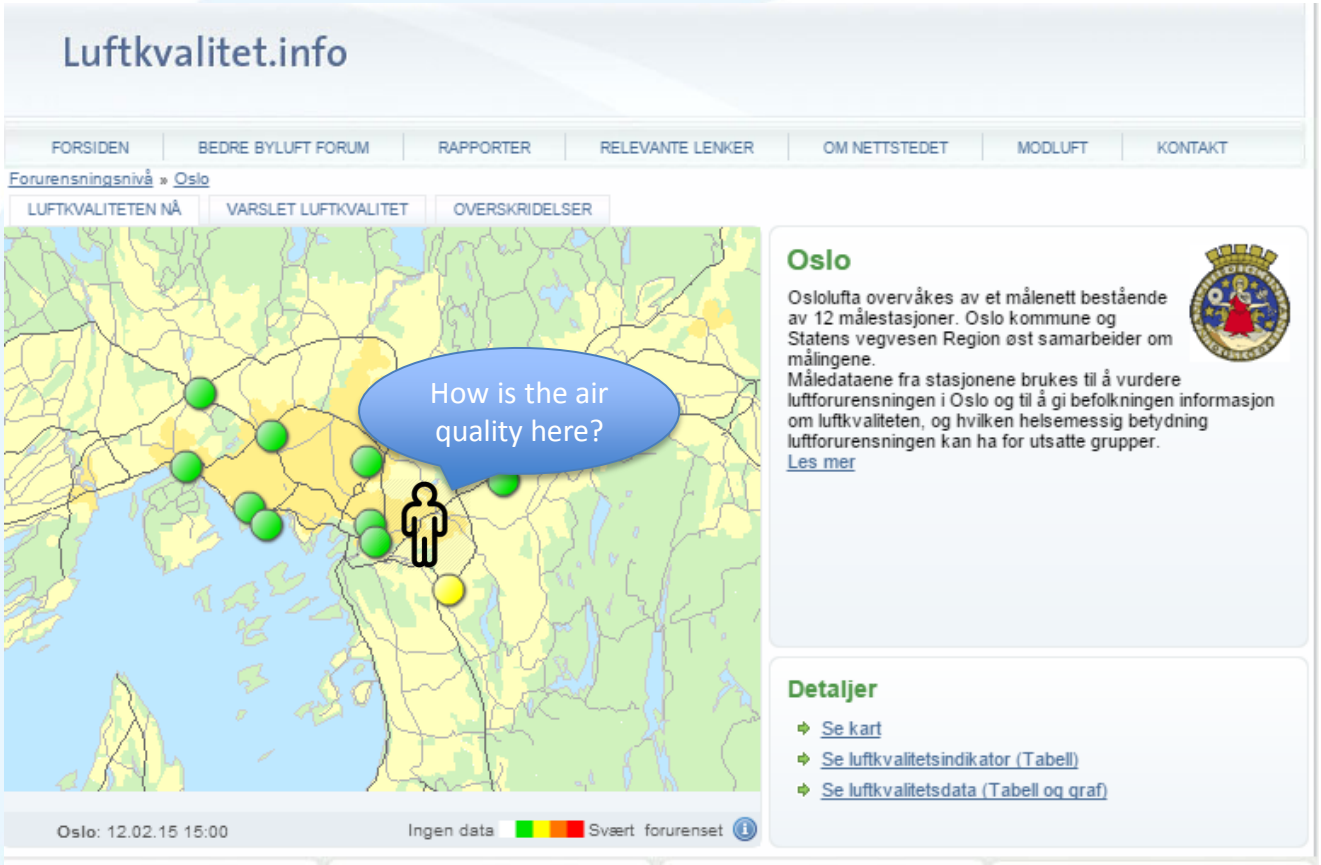
“CLASSIC” VISUALIZATIONS

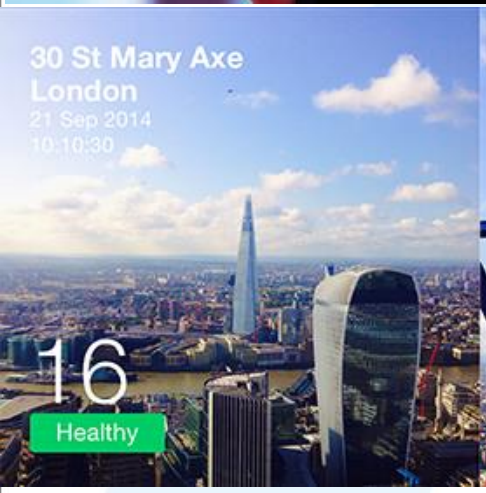
- Designed based on the low spatial (and temporal) resolution air quality information available in the cities.
- Not personalized information.



“PLAYFUL” VISUALIZATIONS

- ✓ Generate an emotional reaction

“PLAYFUL” VISUALIZATIONS



InstaNO2 mobile application

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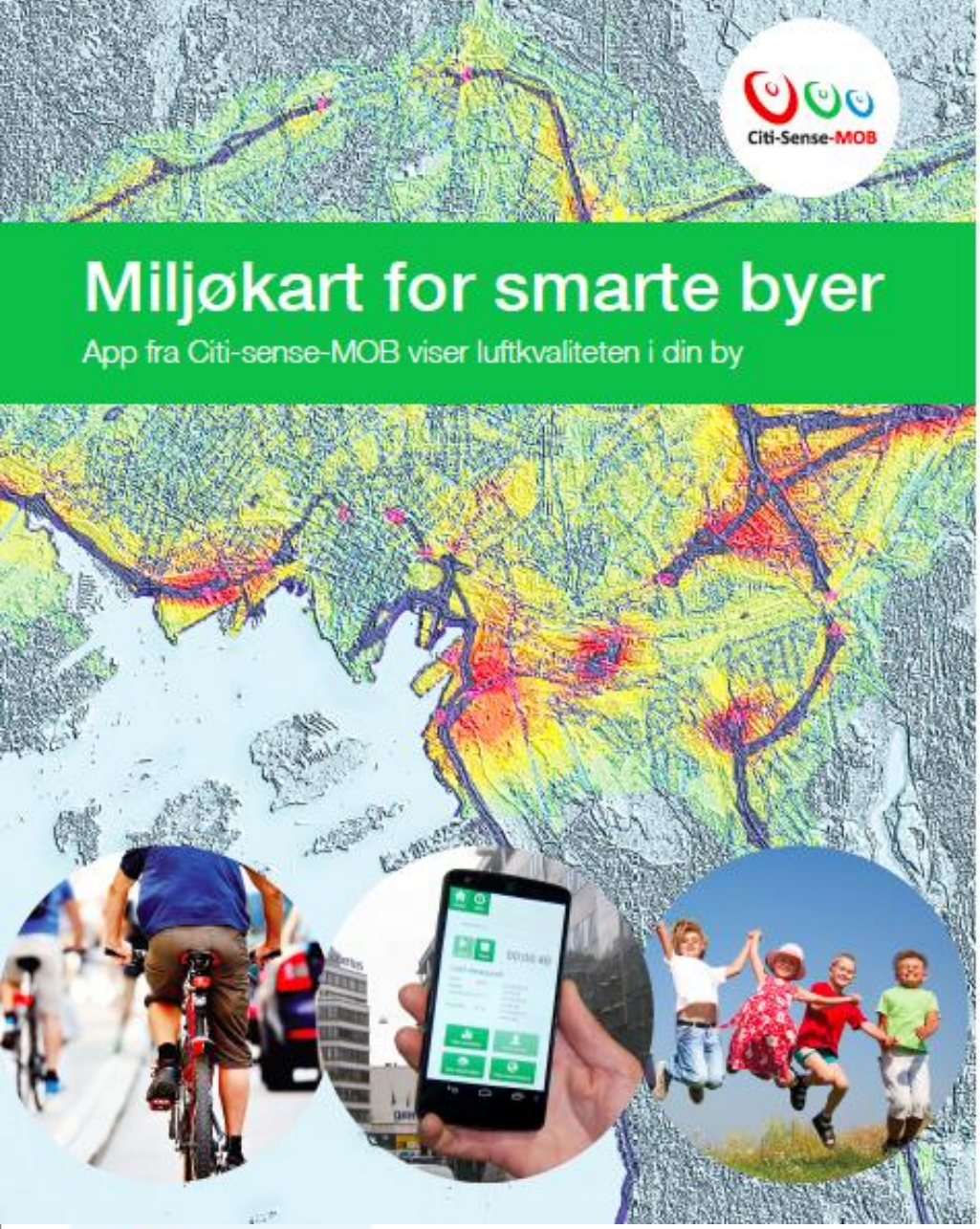

PERSONALIZED INFORMATION

- ✓ Check the air quality in your immediate surroundings.
- ✓ Select less polluted routes to walk or cycle.
- ✓ Track your individual exposure while moving in the city.
- ✓ Receive an alert when going into a zone with high pollution.
- ✓ Contribute with your data and your perception

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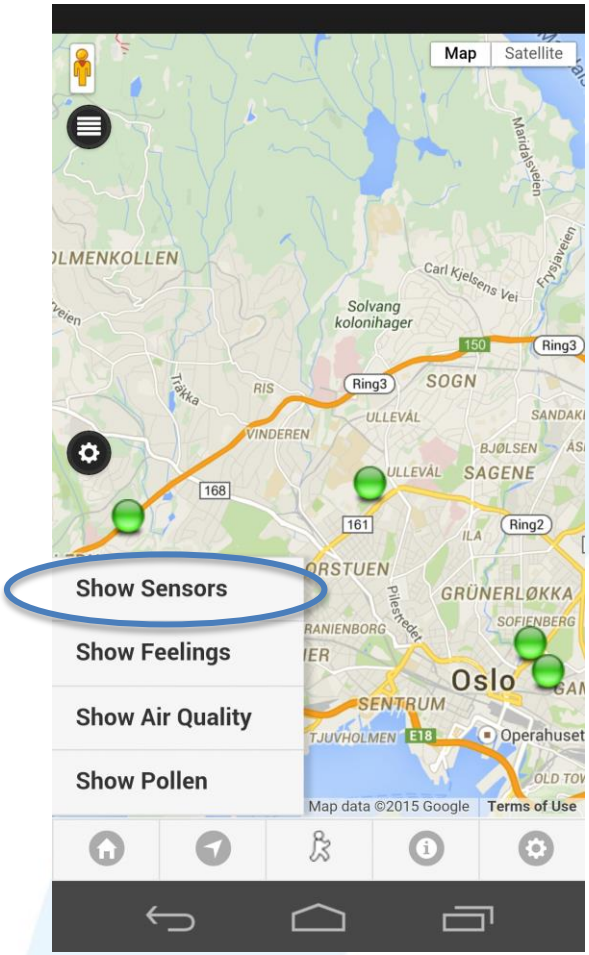
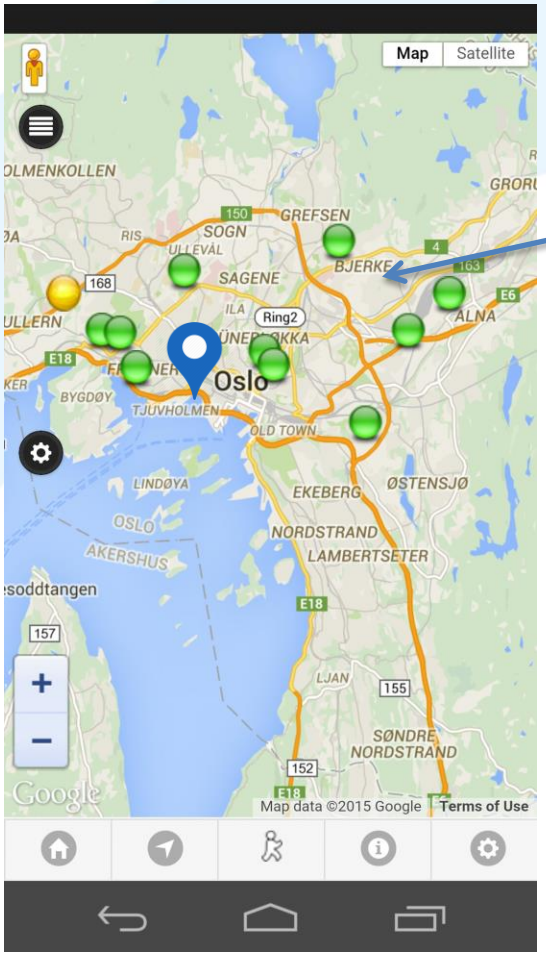
Citi-Sense-MOB Mobile application

Air quality where you are





To be completed with data from low-cost sensors:

- 24 static units
- 11 portable units
- 1 air quality bike
- 2 buses

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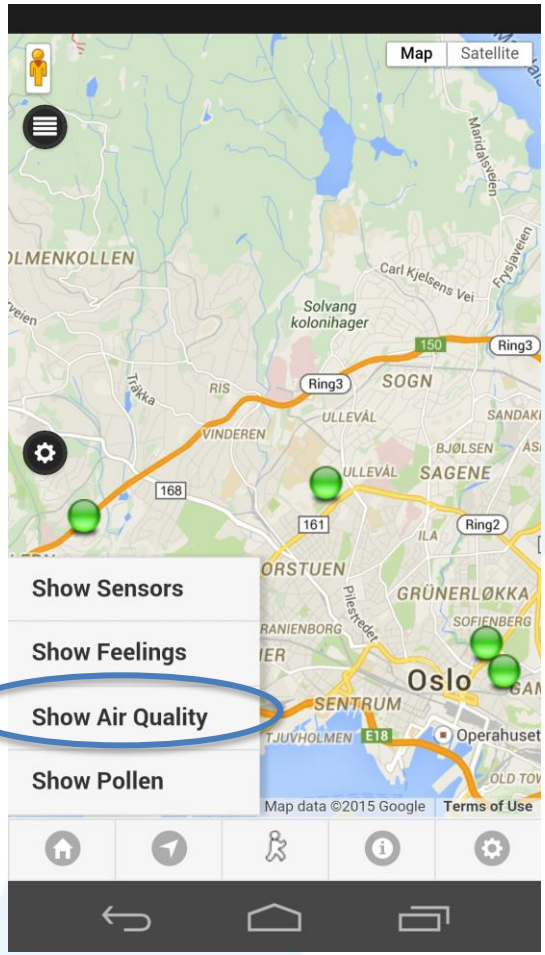
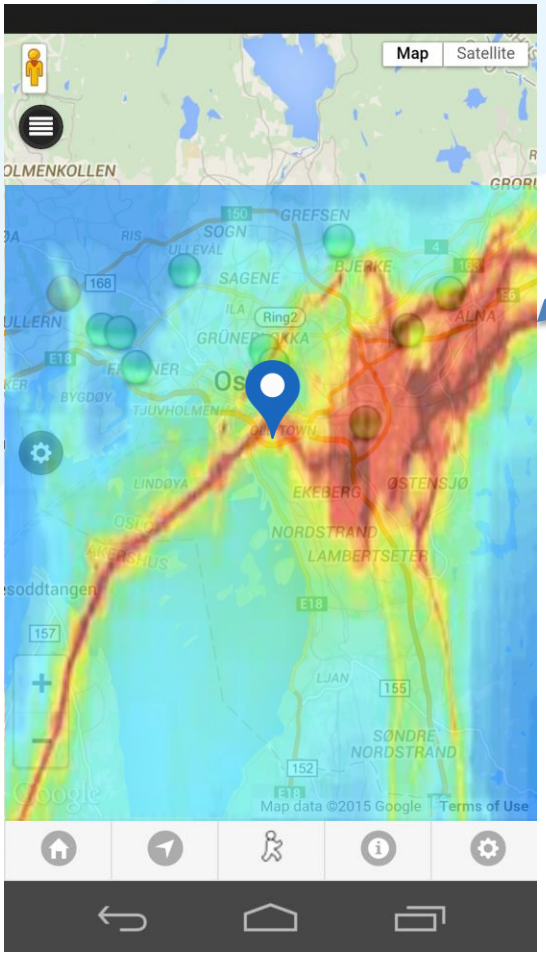
Citi-Sense-MOB Mobile application

Air quality where you are

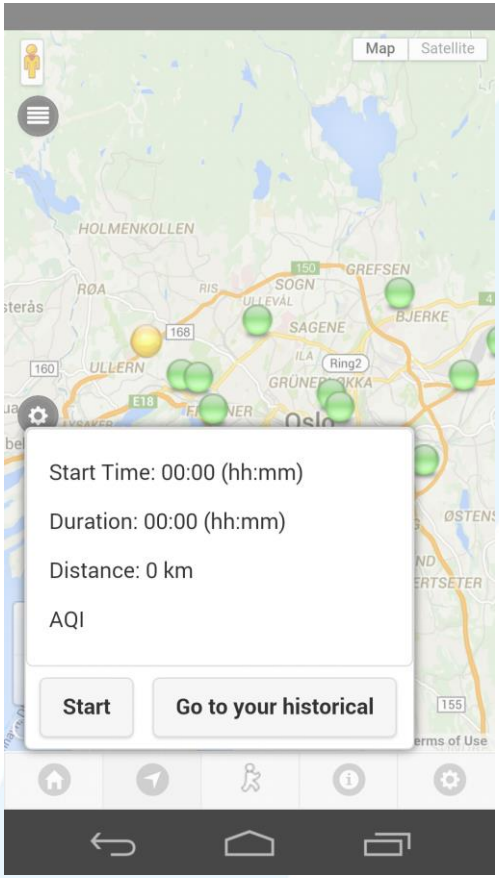


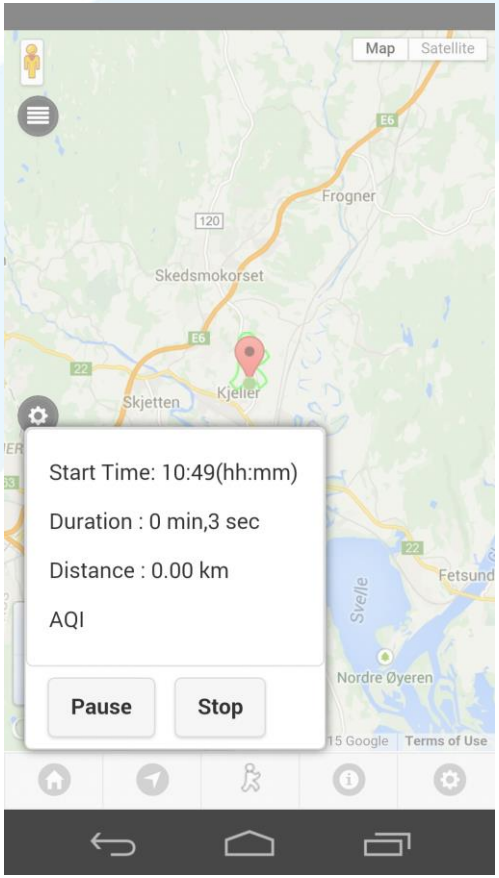


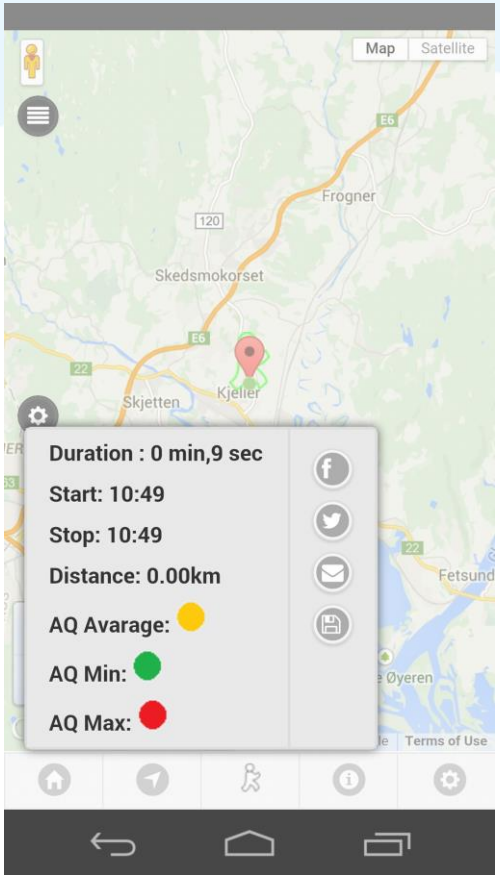
Data fusion map updated every hour

Citi-Sense-MOB Mobile application

Tracking your exposure



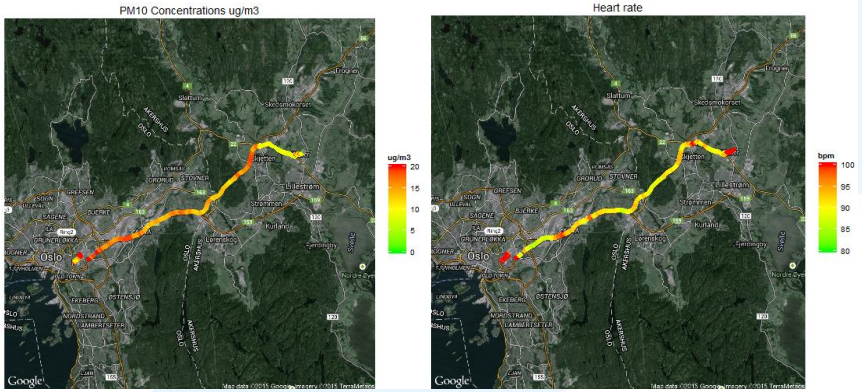


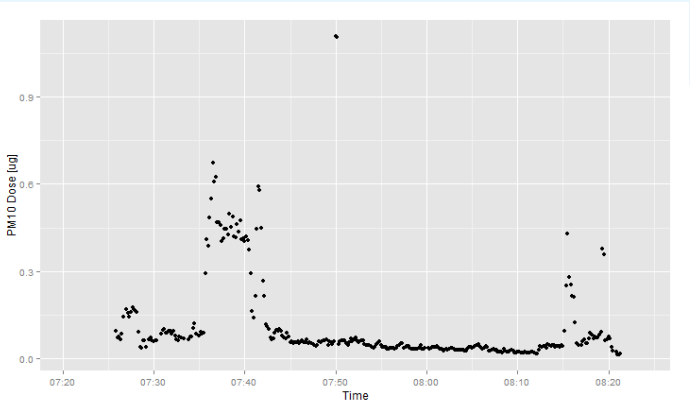


Citi-Sense-MOB Mobile application

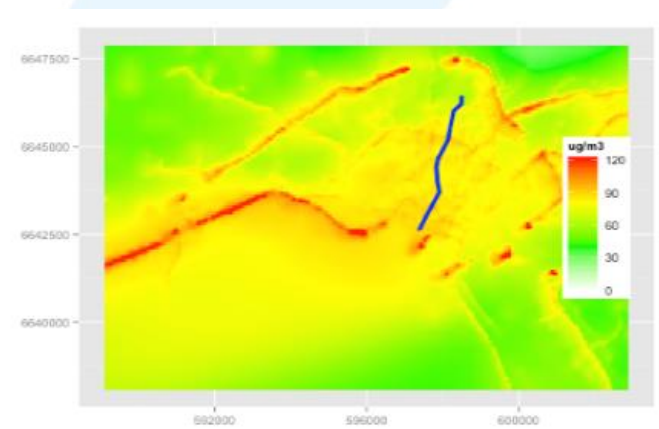
Tracking your exposure

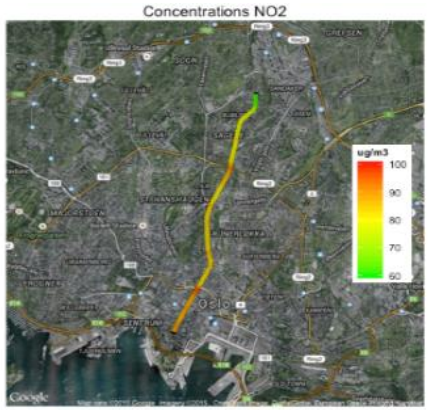
Approach 1: Wearable sensors + Smartphone





Approach 2: Crowdsource map + Smartphone





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Citi-Sense-MOB Mobile application

Personal perception

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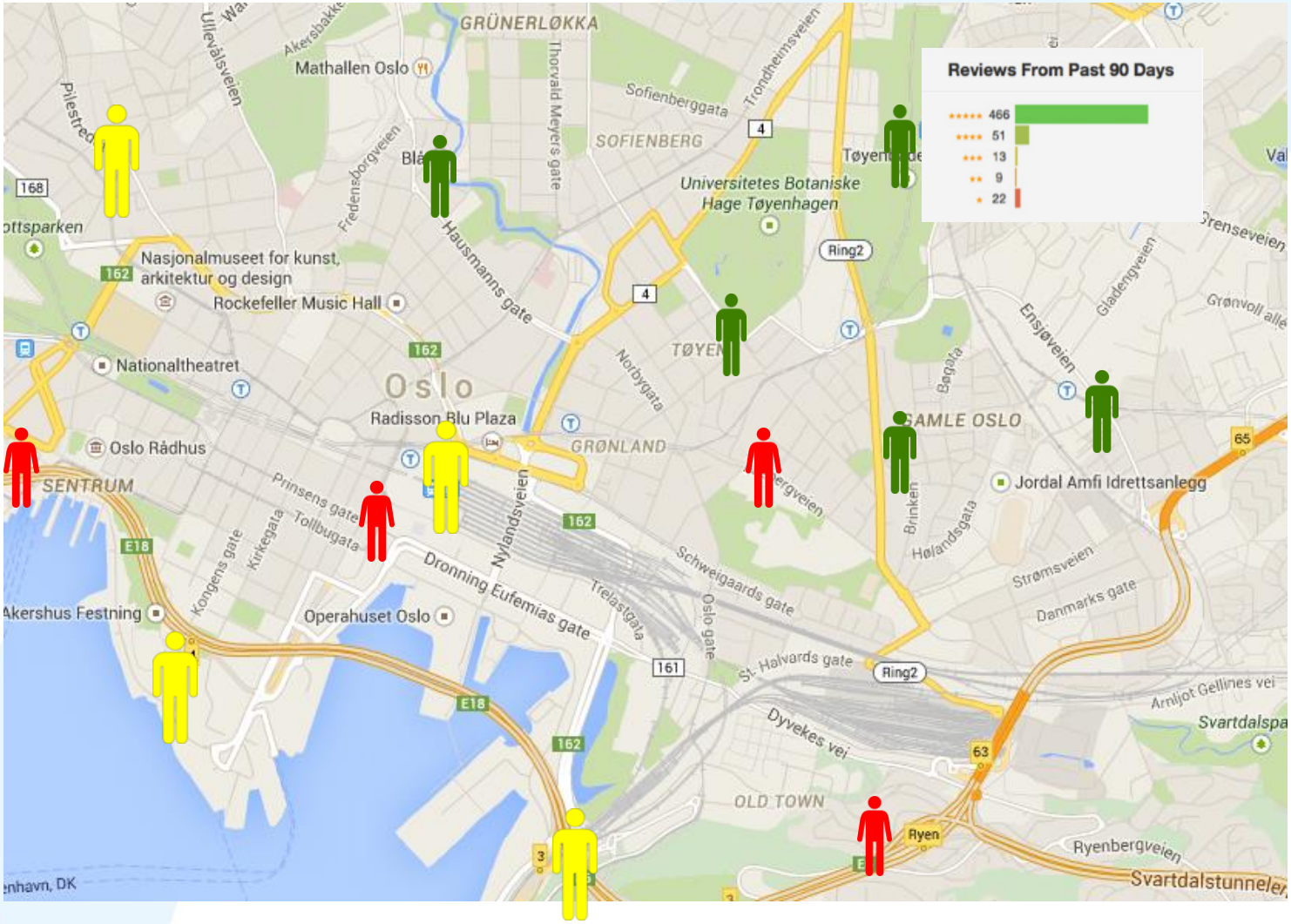
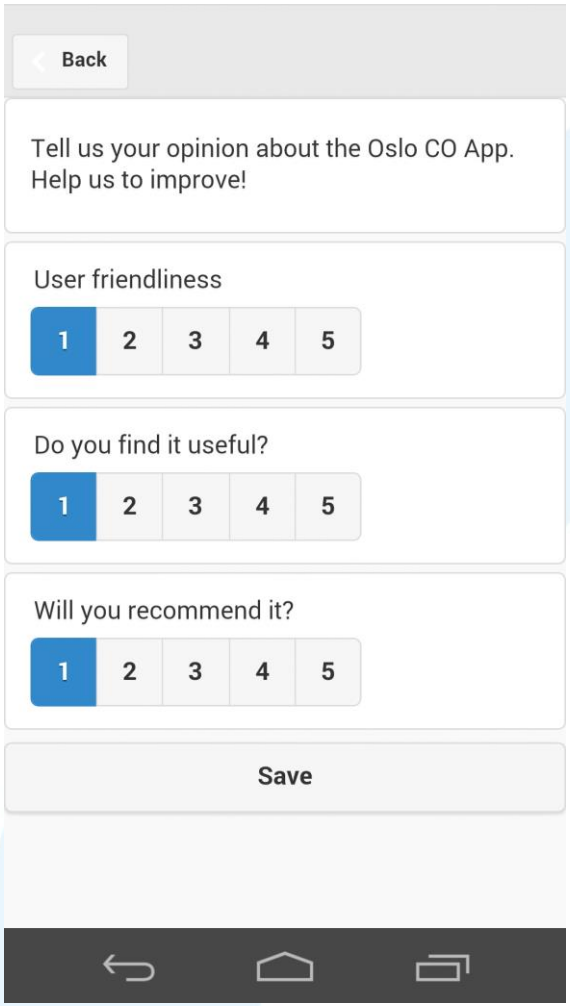
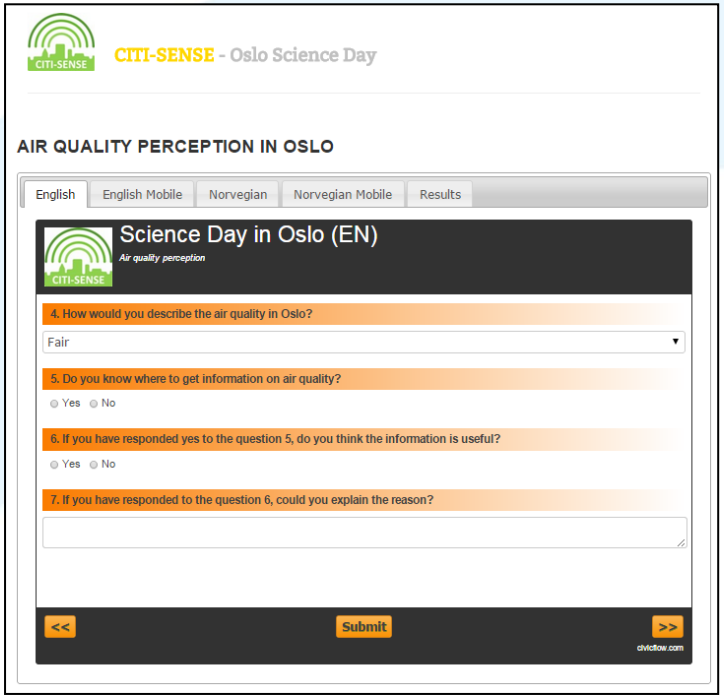
If participation is high, we can rate the places…



Citi-Sense-MOB Mobile application

User feedback





Important to listen to the users and implement co-design approaches

Public are not mere recipients of information, but actors in the decision process

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The goal….

Luftkvalitet.info

FORSIDEN | BEDRE BYLUFT FORUM | RAPPORTER | RELEVANTE LENKER

Forurensningsnivå » Oslo » Manglerud

LUFTKVALITETEN NÅ | VARSLET LUFTKVALITET | OVERSKRIDELSER

Luftkvalitetsindikator

	Luftkvaliteten nå		Siste døgnmiddel		
Komponent	Tid	Verdi	Dato	Verdi	Enhet
NO2	11:00	77,9	18.03.2015	79,5	µg/m³
PM10	11:00	51,3	18.03.2015	50,8	µg/m³
PM2.5	11:00	14	18.03.2015	21,5	µg/m³

Scientific data ⟷ Non-scientist

Use engaging and playful visualizations

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INCREASE PERSONAL EXPERIENCE

Personalized information, wearable sensors, provide personal perception, co-design

NOTICE AIR POLLUTION

Create awareness, change behavior to reduce exposure to air pollution

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Conclusions

We are investigating **how data from low-cost sensors** can contribute to a more **comprehensive understanding of air quality**.

- ✓ Create maps where the people is (personalized information)
- ✓ Create useful visualizations (engaging)
- ✓ Communicate science to non-scientist (including uncertainties)

The mobile phone application developed within the project will contribute to **engage citizens in collecting and sharing environmental data** generated by low-cost air quality sensors, and in reporting their individual perception.

The mobile phone application will be free and will be publicly available in summer 2015.

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Thank you for your attention

Nuria Castell, ncb@nilu.no

NILU Norsk institutt for luftforskning