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Public health impacts of road transportation emissions in Europe

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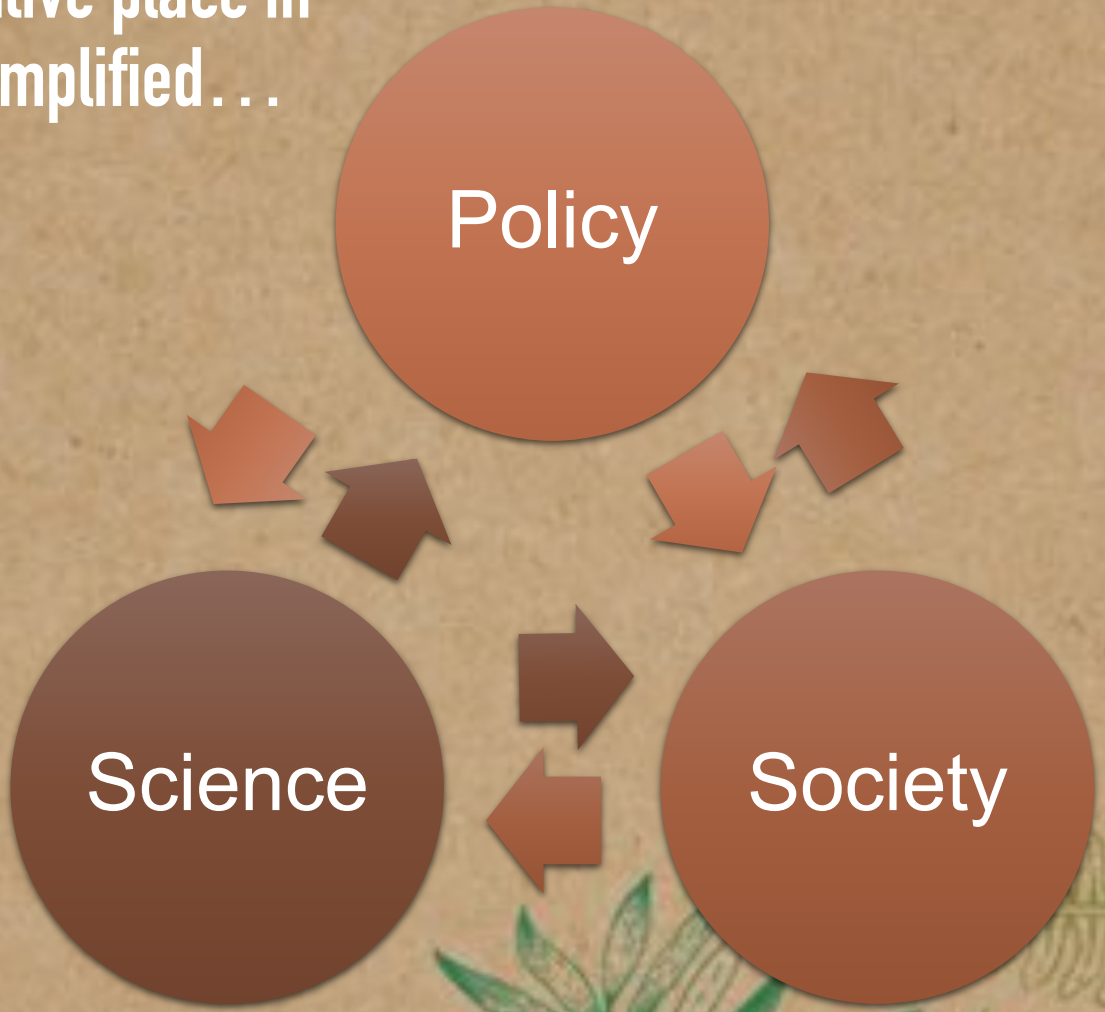
Antwerp, December 14 2018

Disclaimer

- This will be a presentation on scientific enquiry and its value for the general public and policy-makers, in the context of road transport emissions and their impacts

Science's normative place in society – very simplified…



Science under fire

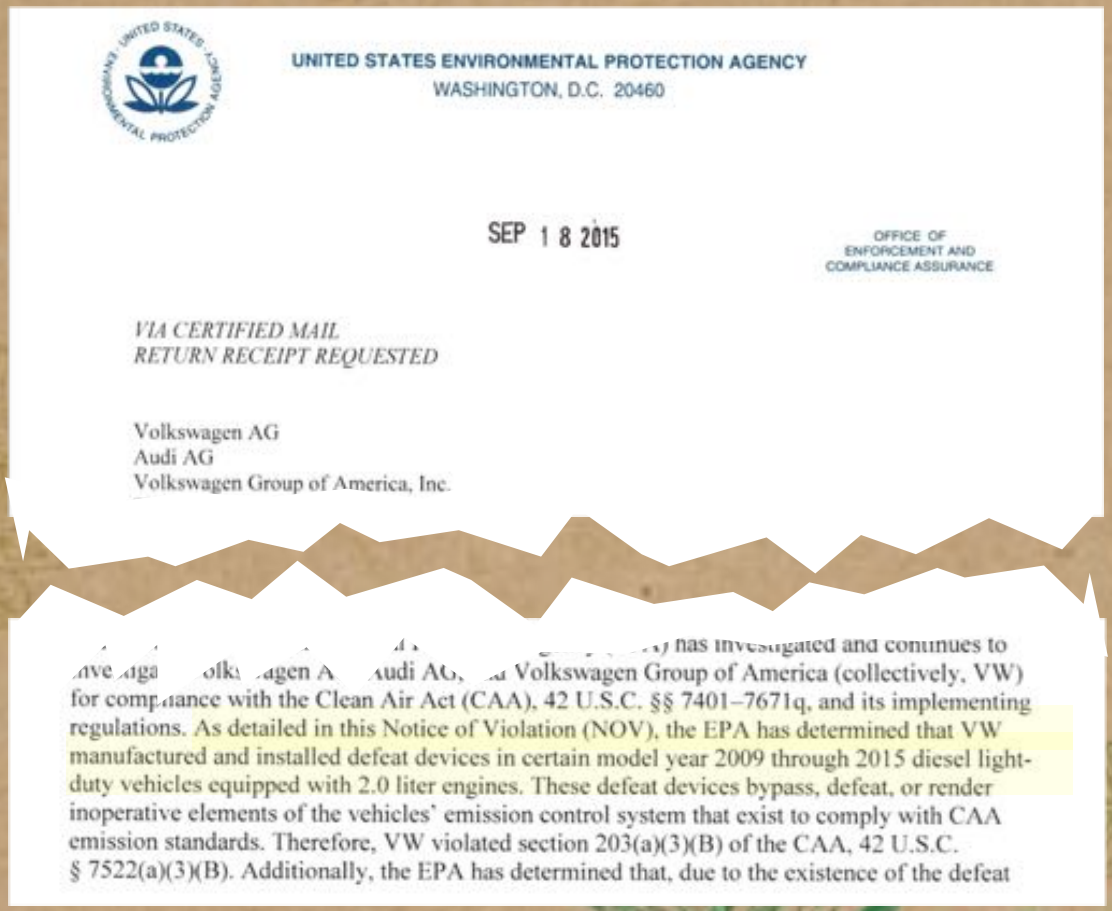
Science is sometimes perceived to be

- too slow to provide answers to policy-makers — "irrelevant"
- out of touch with the actual problems of normal people — "elitist"
- just one truth out of many — "biased"

A (simple) example on science's positive role in public policy and public debate

"DIESELGATE"

September 18 2015: US EPA Notice of Violation



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WASHINGTON, D.C. 20460

SEP 18 2015

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ENFORCEMENT AND
COMPLIANCE ASSURANCE

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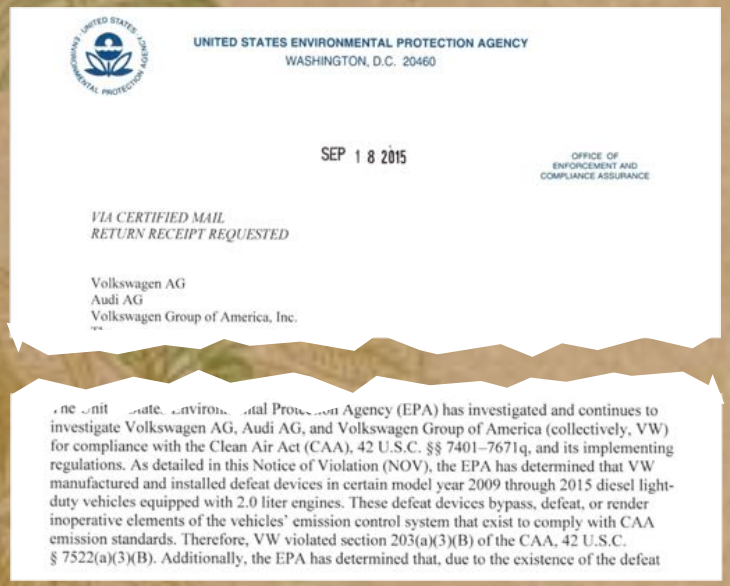
RETURN RECEIPT REQUESTED

Volkswagen AG
Audi AG
Volkswagen Group of America, Inc.

has investigated and continues to
ave aga olk agen A udi AG, Volkswagen Group of America (collectively, VW)
for comp iance with the Clean Air Act (CAA), 42 U.S.C. §§ 7401–7671q, and its implementing regulations. As detailed in this Notice of Violation (NOV), the EPA has determined that VW manufactured and installed defeat devices in certain model year 2009 through 2015 diesel light-duty vehicles equipped with 2.0 liter engines. These defeat devices bypass, defeat, or render inoperative elements of the vehicles' emission control system that exist to comply with CAA emission standards. Therefore, VW violated section 203(a)(3)(B) of the CAA, 42 U.S.C. § 7522(a)(3)(B). Additionally, the EPA has determined that, due to the existence of the defeat

Questions by the general public & policy-makers



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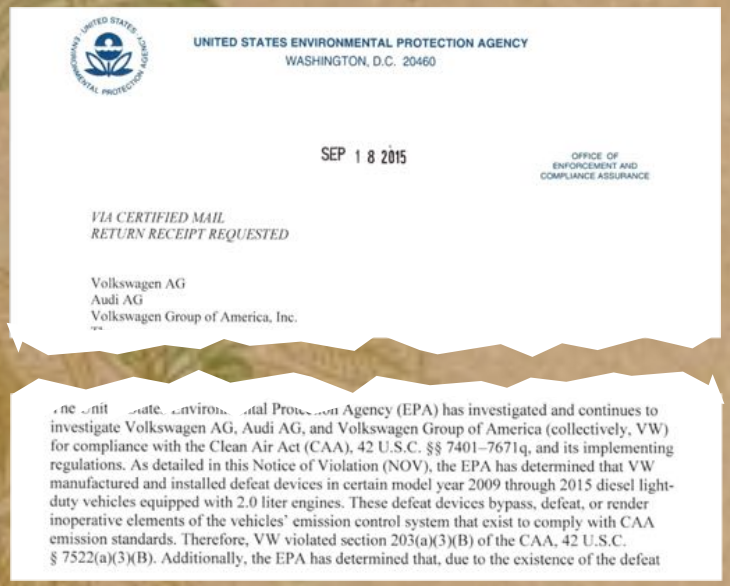
1. What is the difference between on-road and test-stand emissions for VW cars?
2. Can we see a discrepancy for models of other manufacturers, as well?
3. What are the consequences of these "excess" emissions?
4. What can we do about the "excess" and how much would it cost?

TODAY, December 14 2018



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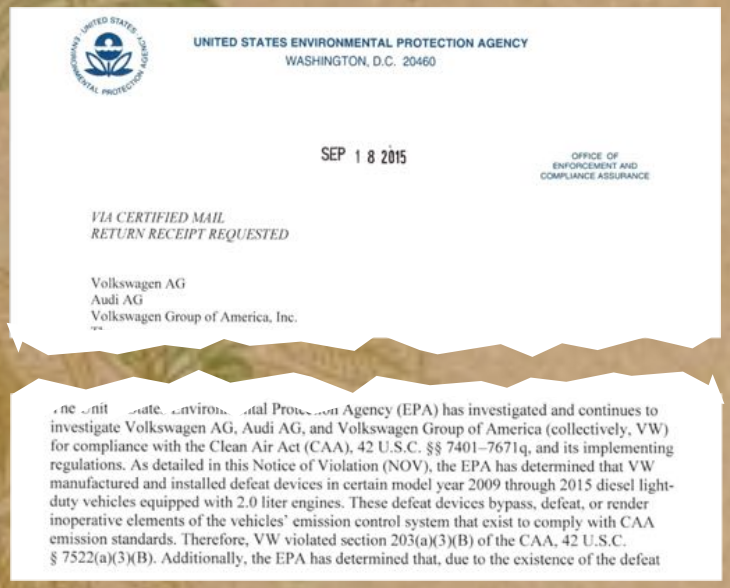
- Audi CEO in jail, with other executives from VW group
- VW group has paid approx. 27bn USD in fines/damages (with many law suits not completed, yet)
- What was the VW emissions scandal has become "dieselgate" with many car manufacturers implicated for using defeat devices or gaming the emission testing protocols
- Wider public better aware of the public health consequences of excess emissions
- Public perception of diesel cars as a "cleaner alternative" to petrol cars has vanished
- Testing procedures for emission reporting have been tightened in Europe
- New emission standards have come into force
- Access restrictions for older diesel cars have been imposed in cities across Europe

Questions by the general public & policy-makers:



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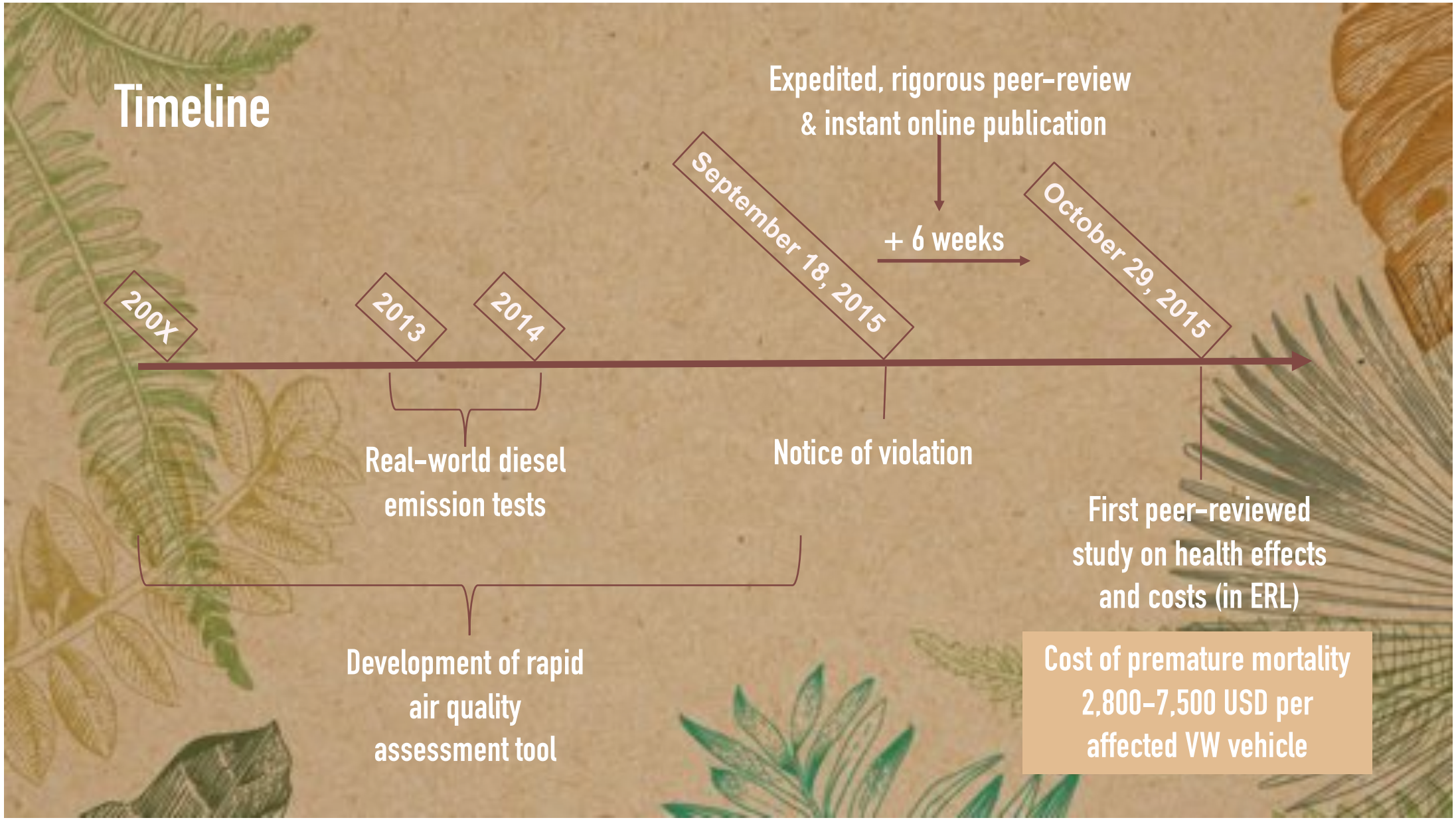
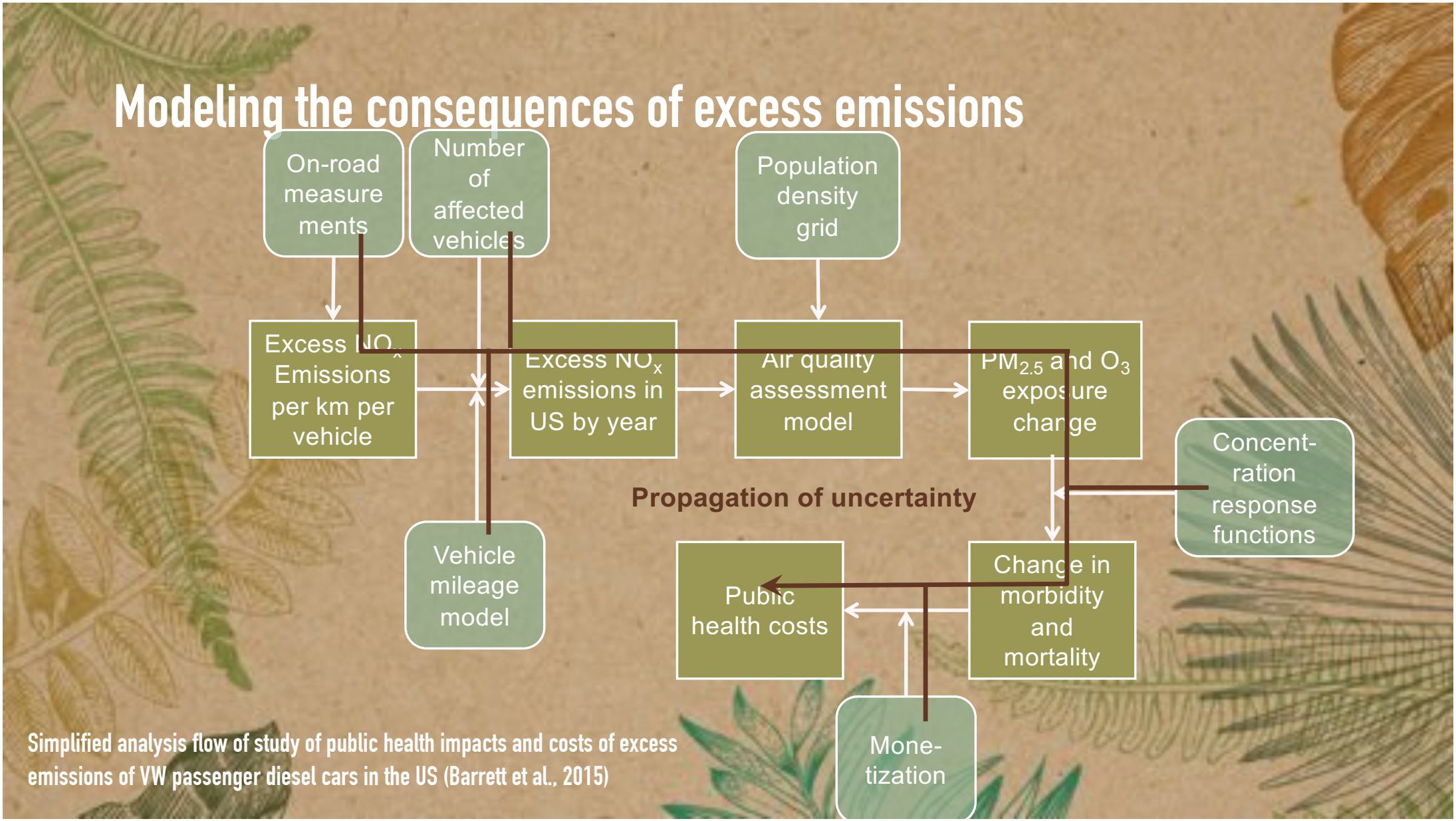
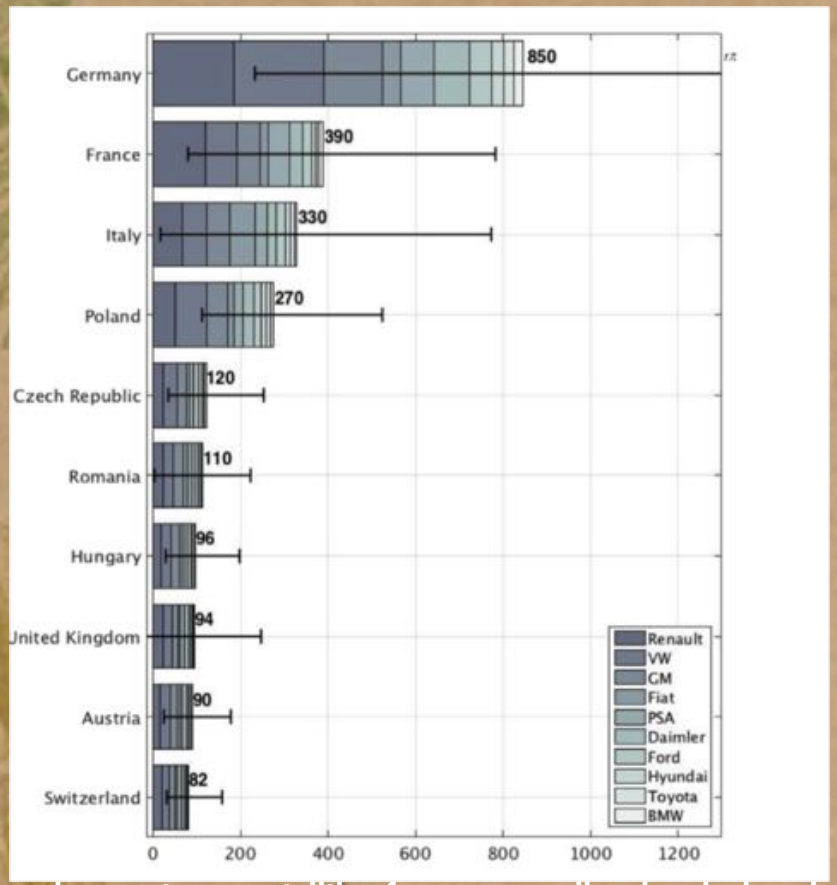

Timeline
Expedited, rigorous peer-review
& instant online publication
+ 6 weeks
200X
2013
2014
September 18, 2015
October 29, 2015
Real-world diesel
emission tests
Notice of violation
First peer-reviewed
study on health effects
and costs (in ERL)
Development of rapid
air quality
assessment tool
Cost of premature mortality
2,800–7,500 USD per
affected VW vehicle

Modeling the consequences of excess emissions



Simplified analysis flow of study of public health impacts and costs of excess emissions of VW passenger diesel cars in the US (Barrett et al., 2015)

Health effects & costs from excess emissions in Europe



Annual premature mortalities from excess diesel emissions in Europe, 10 countries with the highest impact, Source: Chossiere et al. (2018).

- Strong evidence from multiple studies that diesel passer car excess emissions cause premature mortality in Europe on the order of several thousand cases per year, leading to health costs of several bn. EUR annually.

Health effects & costs from excess emissions in Europe

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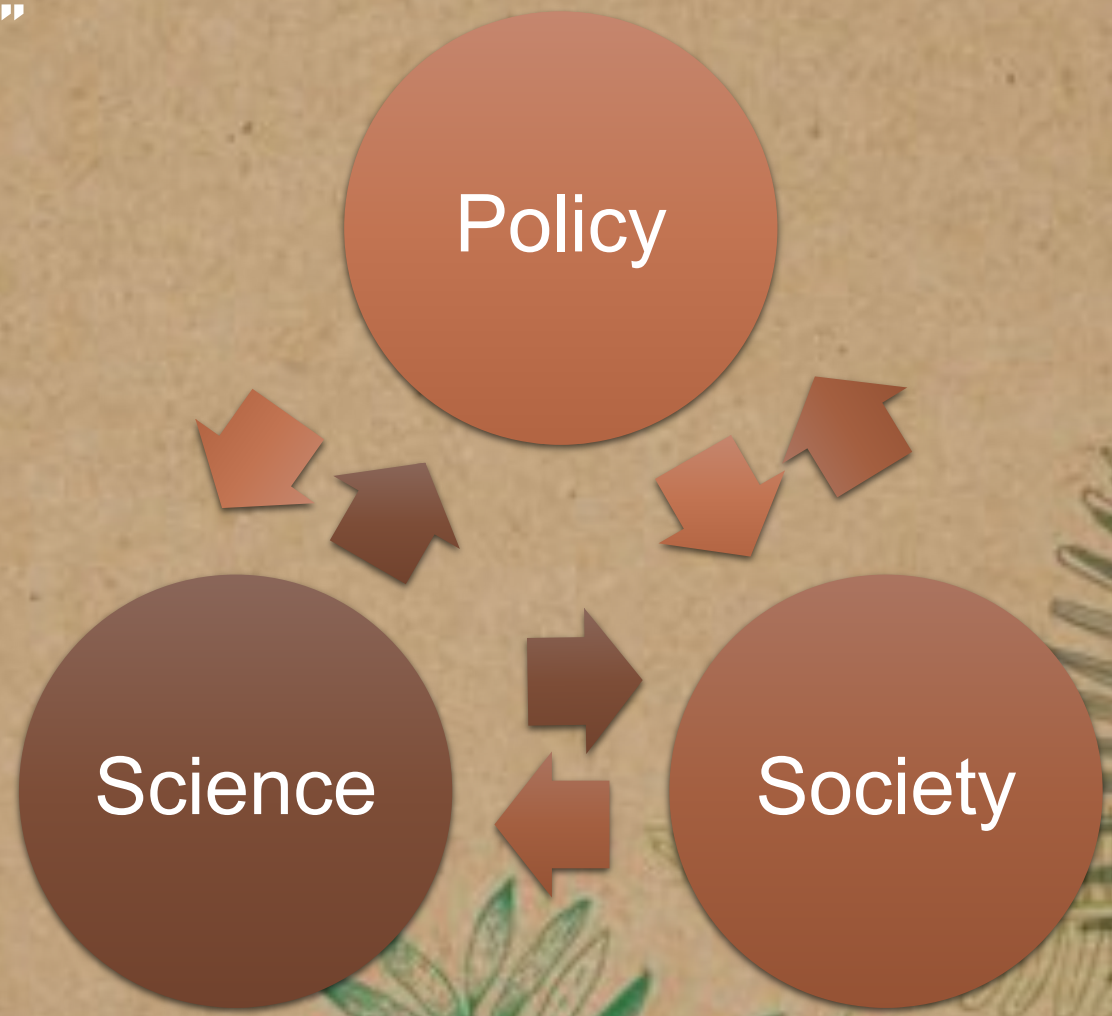
	Premature mortalities per million cars	Premature mortalities per Gg (or kt) excess NO_x
BMW	13 (−0.4; 35)	3.8 (0.54; 8.4)
Daimler	49 (1.6; 140)	4.4 (0.8; 8.5)
Fiat	25 (2.5; 71)	4.2 (0.87; 8.5)
Ford	20 (2.6; 47)	3.7 (0.56; 7.3)
GM	52 (8.9; 120)	4 (0.77; 7.8)
Hyundai	41 (8.7; 83)	4.1 (0.85; 7.9)
PSA	18 (4.2; 40)	4.3 (1.5; 8.1)
Renault	58 (13; 140)	4.6 (1.8; 8.6)
Toyota	20 (3; 48)	4.1 (1; 7.9)
VW	32 (0.85; 89)	4.4 (0.98; 8.5)
Total	33[b] (8; 67)	4[b] (1.1; 8)

Total impacts of excess on-road NOx emissions in Europe attributed to each manufacturer. Mean values are presented, with 95% confidence intervals in parenthesis. Source: Chossiere et al. (2018).

- Strong evidence that differences in impacts between manufacturers cannot be fully explained by differences in fleet size or market penetration: It is possible to emit less!

"Dieselgate science"

- Irrelevant?
- Elitist?
- Biased?



What is Science?

- Science is not the "view from nowhere", uniformed by human goals and values
- It is influenced by human values and value judgements, e.g.:
  - Research questions impacted by society's values (and funding decisions)
  - Ethical boundaries of research
  - Benefits of evidence-based research
- Value-free science is unattainable, and non-desirable

What is Science?

- Science is aiming to be impartial – but not neutral
- Impartiality: All arguments / hypotheses within the societal boundaries of research are assessed with the same rigorous tools of inquiry. – ex ante all arguments / hypotheses are equal.
- Non-Neutrality: Some arguments / hypotheses carry higher "credibility" after the assessment with the same tools of inquiry. – ex-post not all arguments / hypotheses are equal.

Non-neutrality of science confused with biased science

- It is non-neutral to say that there is a link between excess diesel emissions and morbidity and mortality.

- It is non-neutral to say that immediate and substantial action is required in order to keep global warming under 1.5 degree Celsius.

➢ But both claims are not biased as long as they are backed by best available evidence using impartial methods of inquiry.

“Dieselgate science”

A small example for science’s ability to abandon the ivory tower and to provide answers for questions of high societal urgency – in an impartial, non-neutral way.

Prof Dr Robert Malina

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References:

(1) Barrett, S. / Speth, R. / Eastham, S. / Dedoussi, I. / Ashok, A. / Malina, R. / Keith, D. (2015): Impact of the Volkswagen emissions control defeat device on US public health, in: Environmental Research Letters, Vol. 10, 114005

(2) Chossière, G. / Malina, R. / Allroggen, F. / Eastham, S. / Speth, R. / Barrett, S. (2018): Country- and manufacturer-level attribution of air quality impacts due to excess NOx emissions from diesel passenger vehicles in Europe, in: Atmospheric Environment, Vol. 189, pp. 89–97.