Appraisal project

EU FP7 APPRAISAL project (308395)

SEFIRA IS A EU FP7 COORDINATION ACTION ON
Socio Economic Implications
For Individual Responses to
Air Pollution policies in EU +27

EU FP7 SEFIRA project (603941)

ATHLeTiC
Air qualiTy and Life styles: HeaLTh Cobenefits

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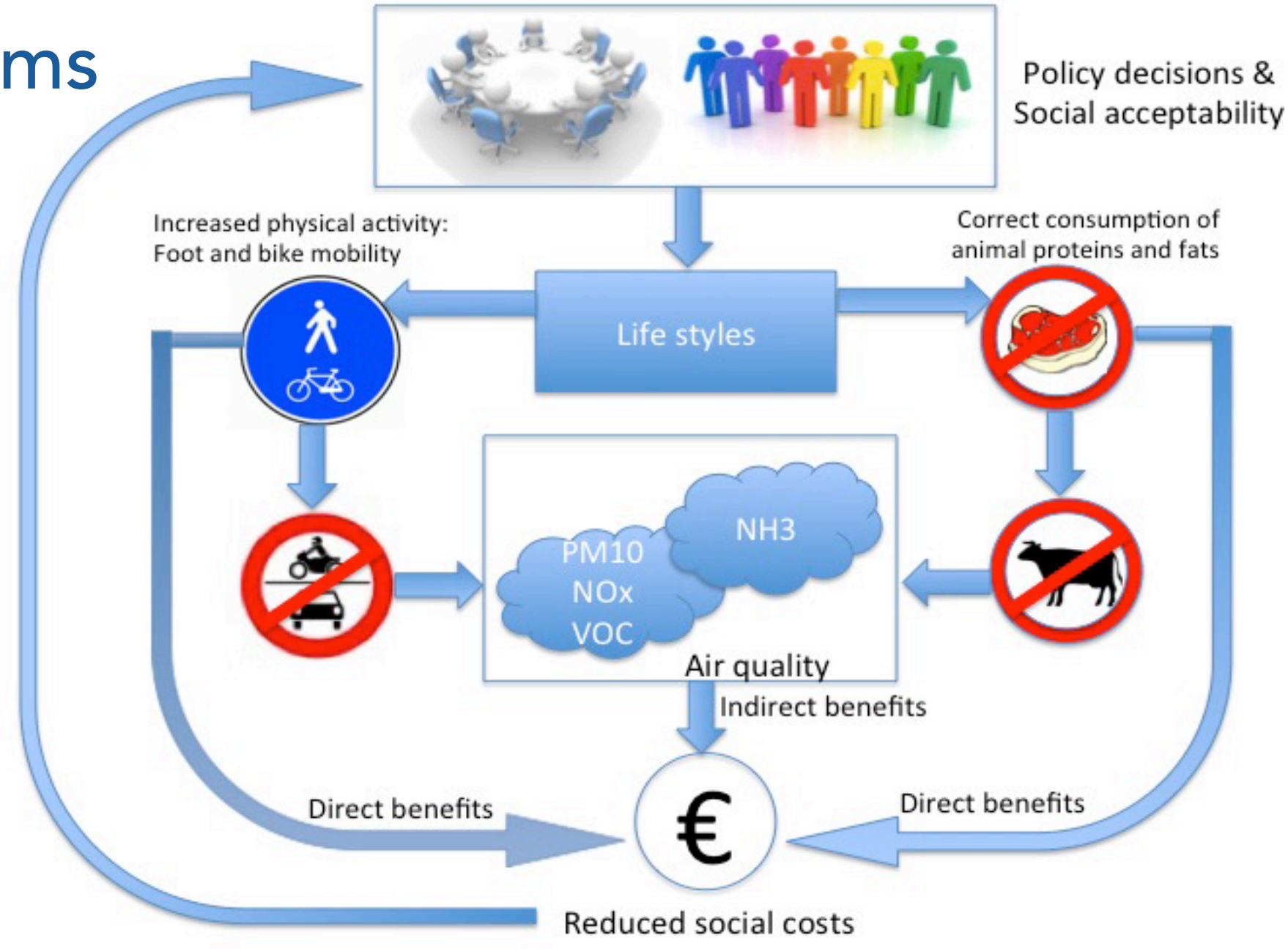
Project aims



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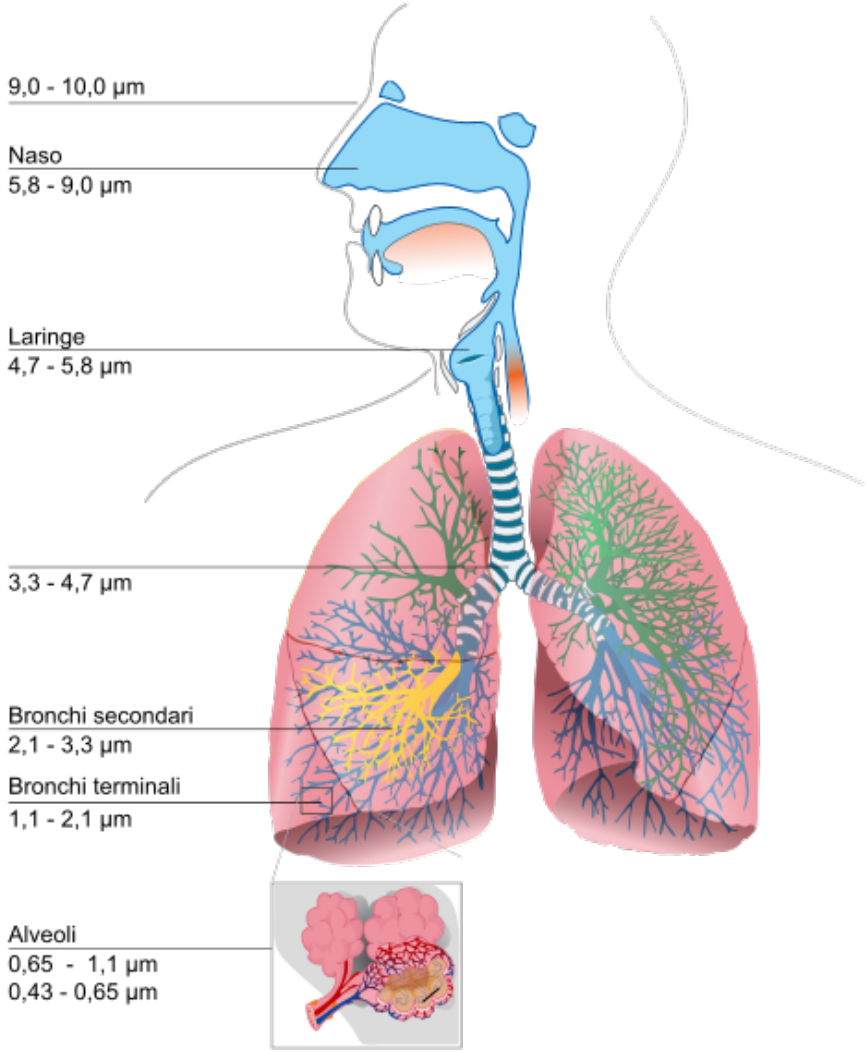
PM exposure health impact



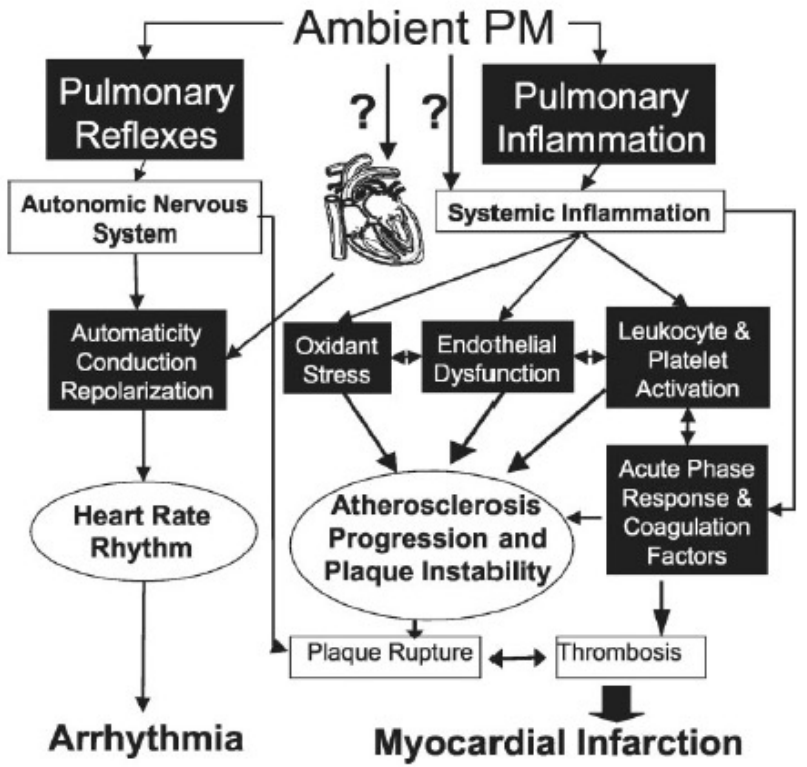


Figure 2. Possible biological mechanisms linking PM with cardiovascular disease.

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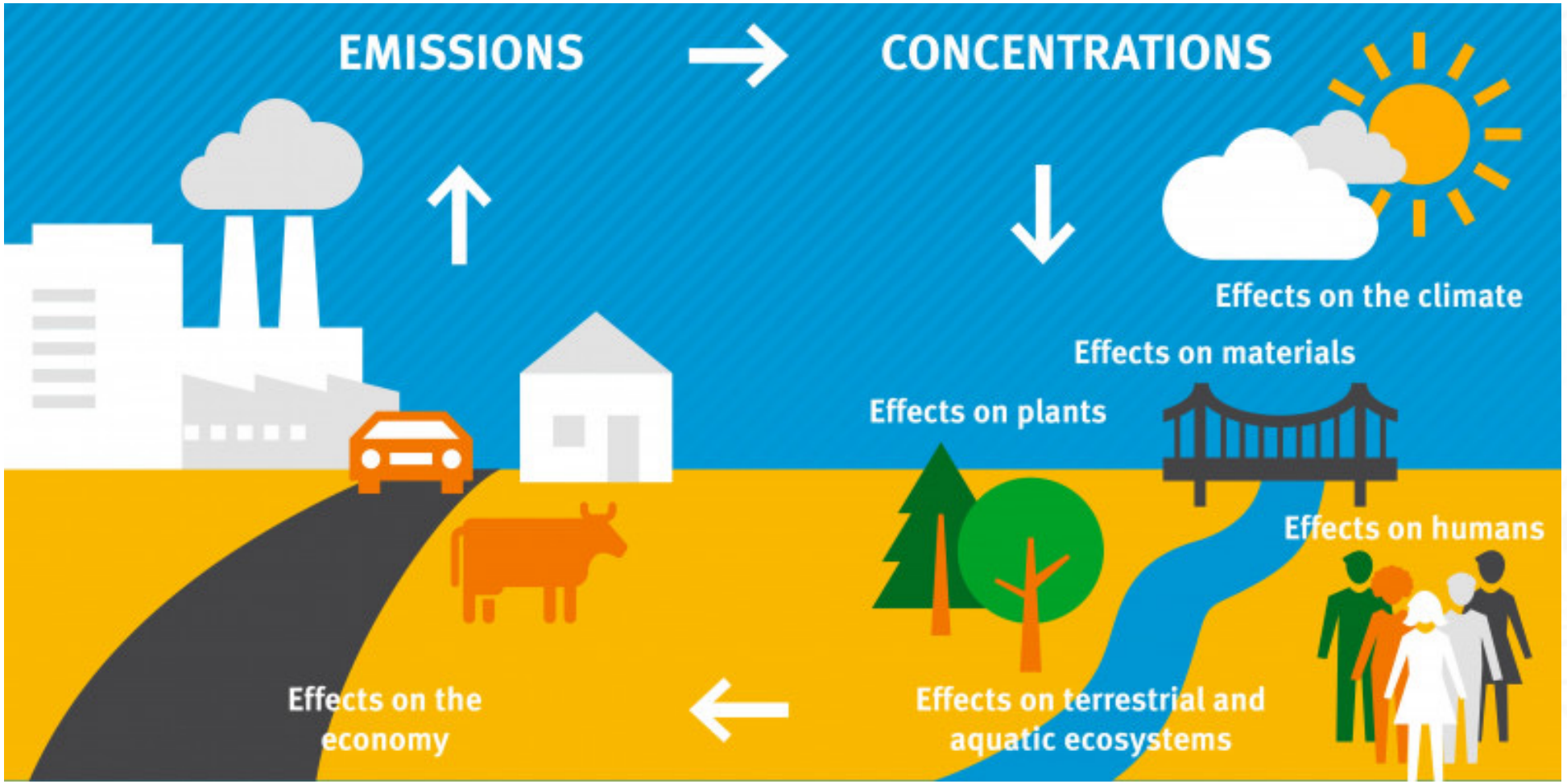
Integrated assessment



https://www.umweltbundesamt.de/en/about-niam

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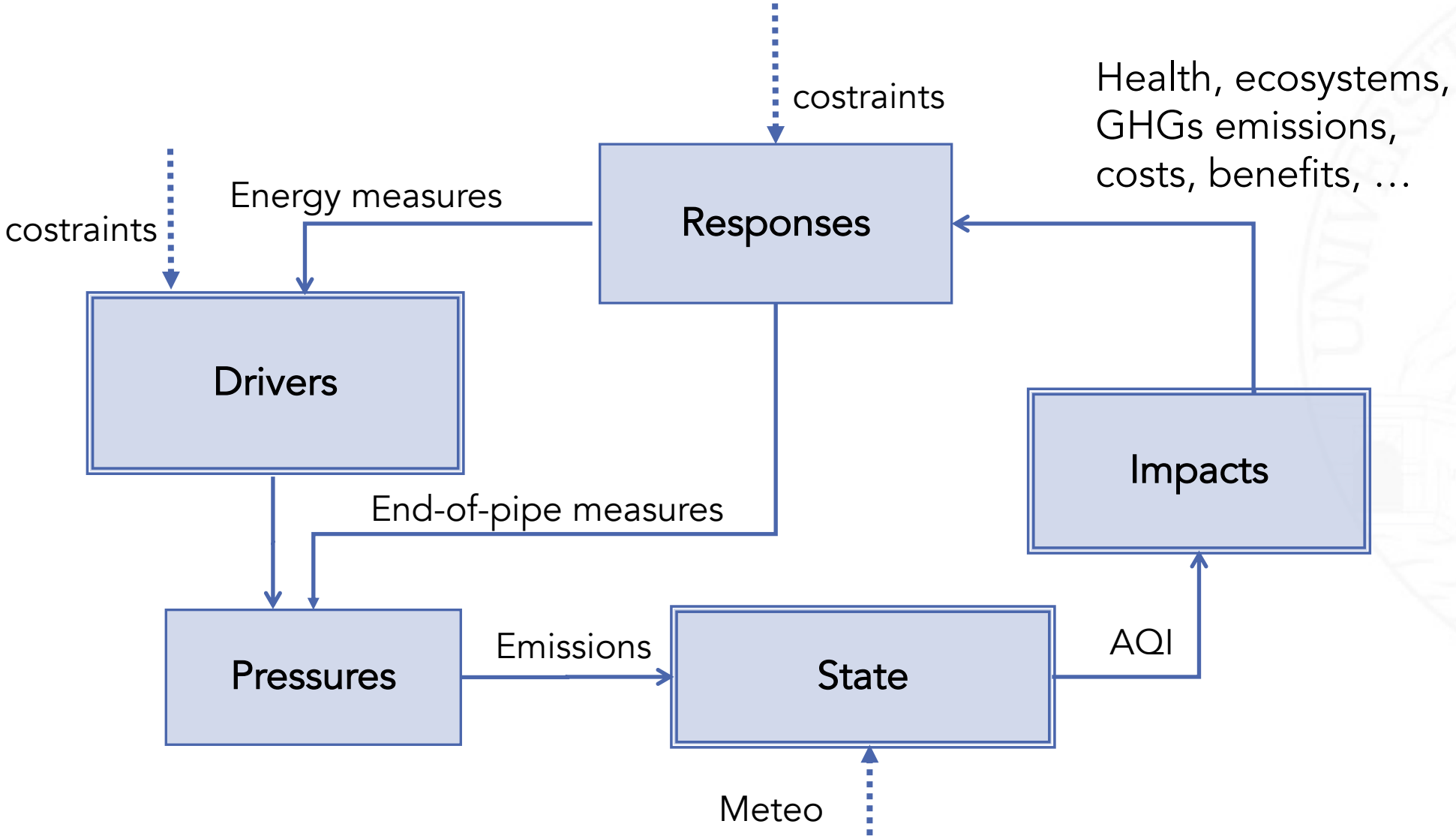
EEA-DPSIR



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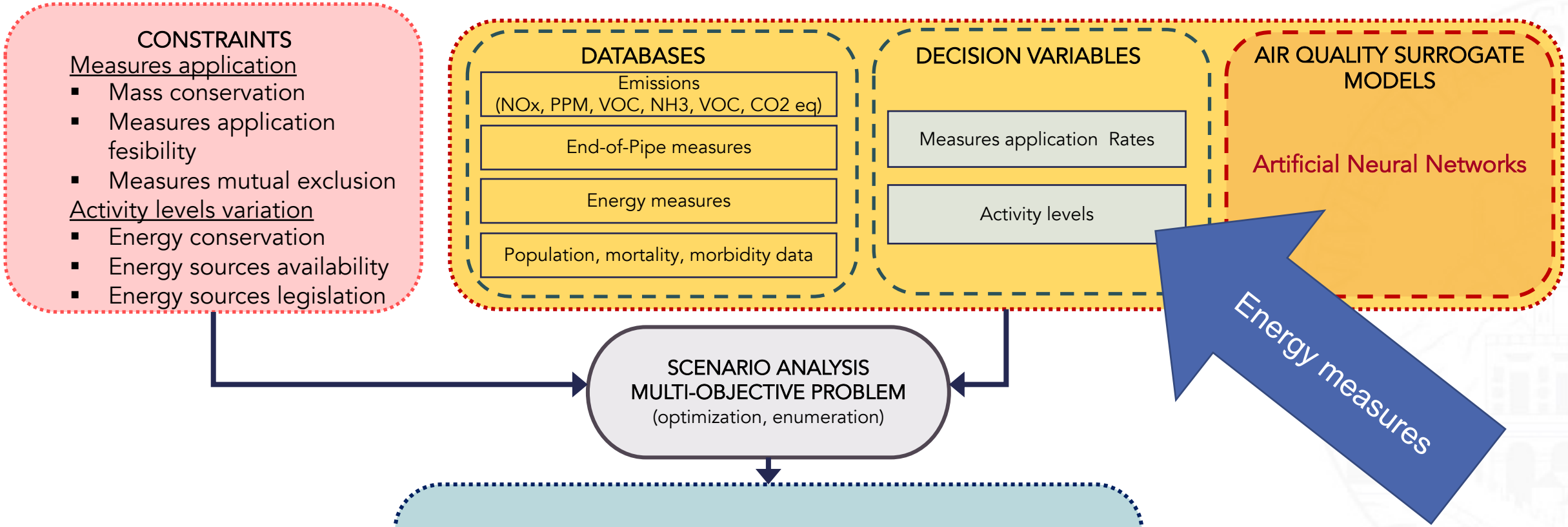
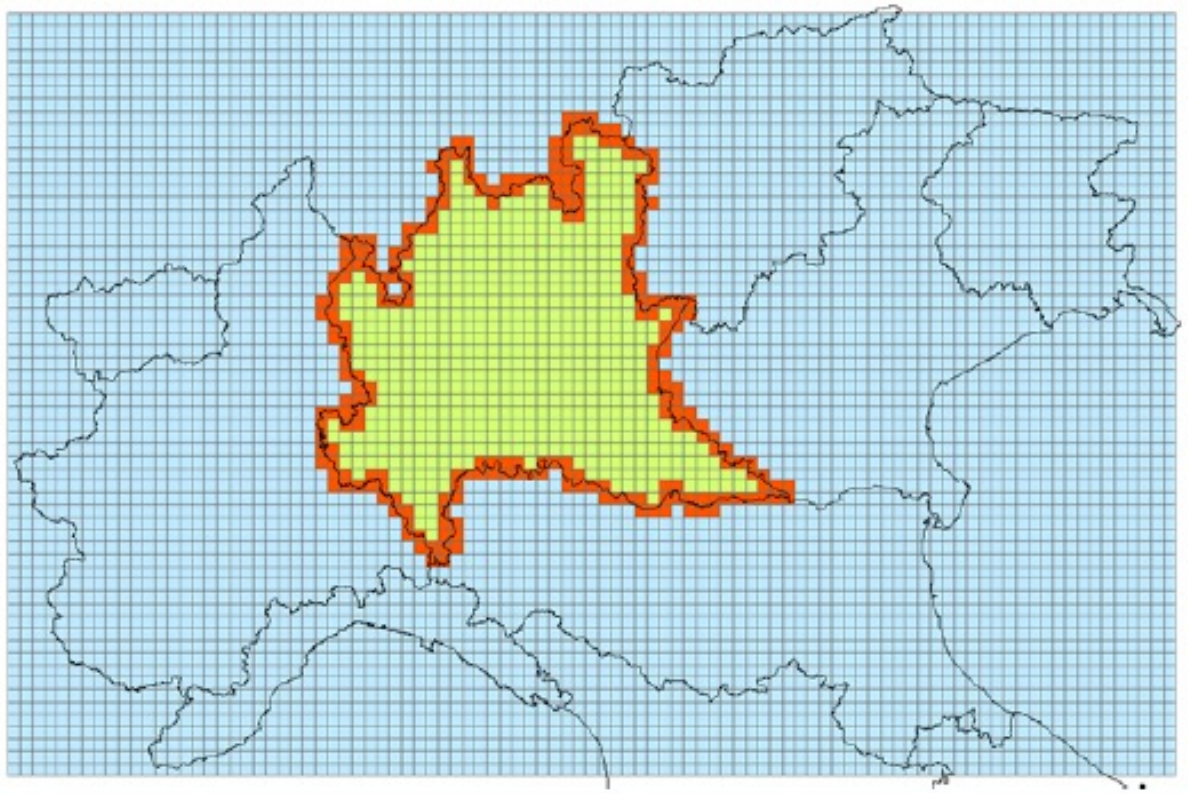
MAQ (Multi-dimensional Air Quality) System



Turrini E. et al. **A non-linear optimization programming model for air quality planning including co-benefits for GHG emissions** Sci. Total Environ., 621 (2018), pp. 980-989

CASE STUDY

- PM10 exceeds limits
- Densely populated and industrialized
- Presence of intensive farming in the central/southern part of the domain



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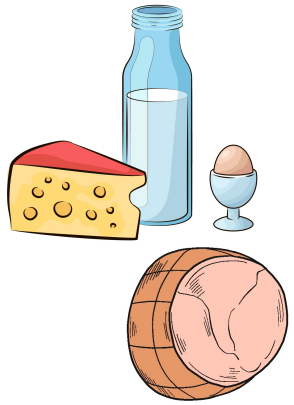
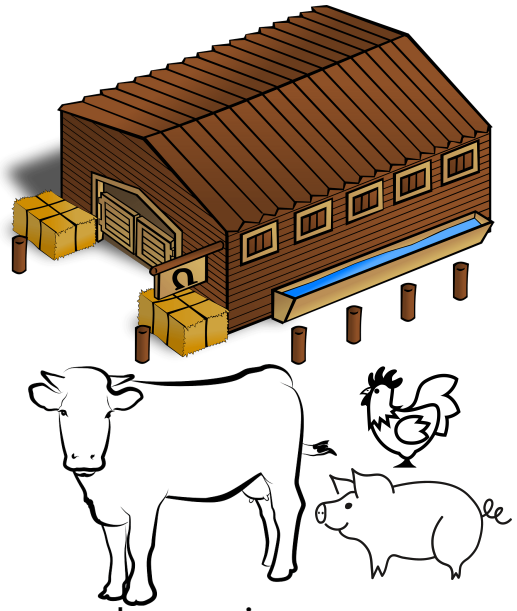
Animal protein intake



Animal protein intake

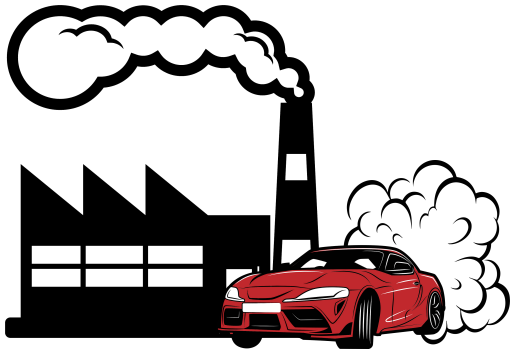


Intensive livestocks

NH3 emissions

Secondary Inorganic PM fraction

SOx, NOx emissions



Health impacts

Indirect health impact

Direct health impact

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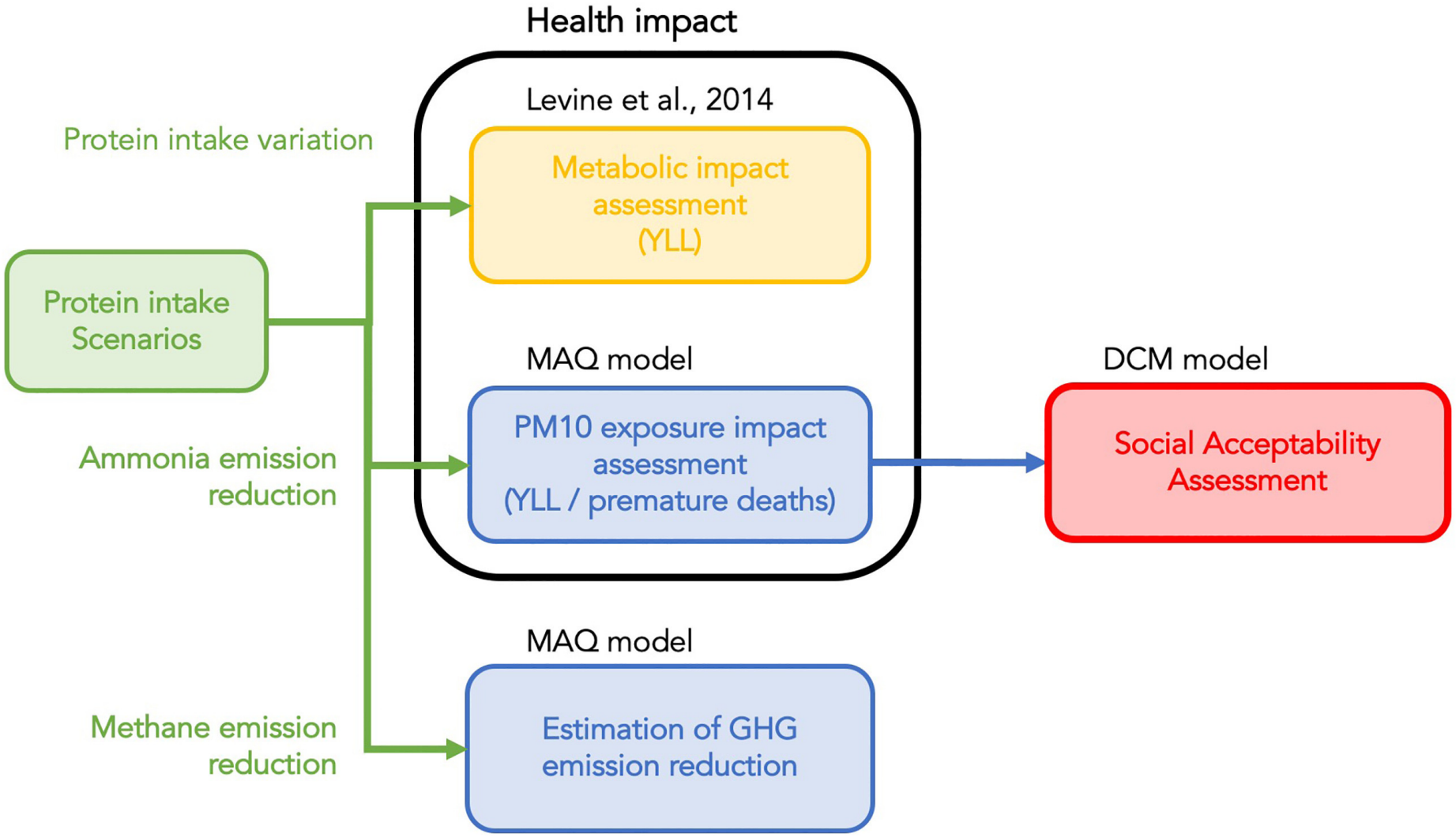
Modelling scheme



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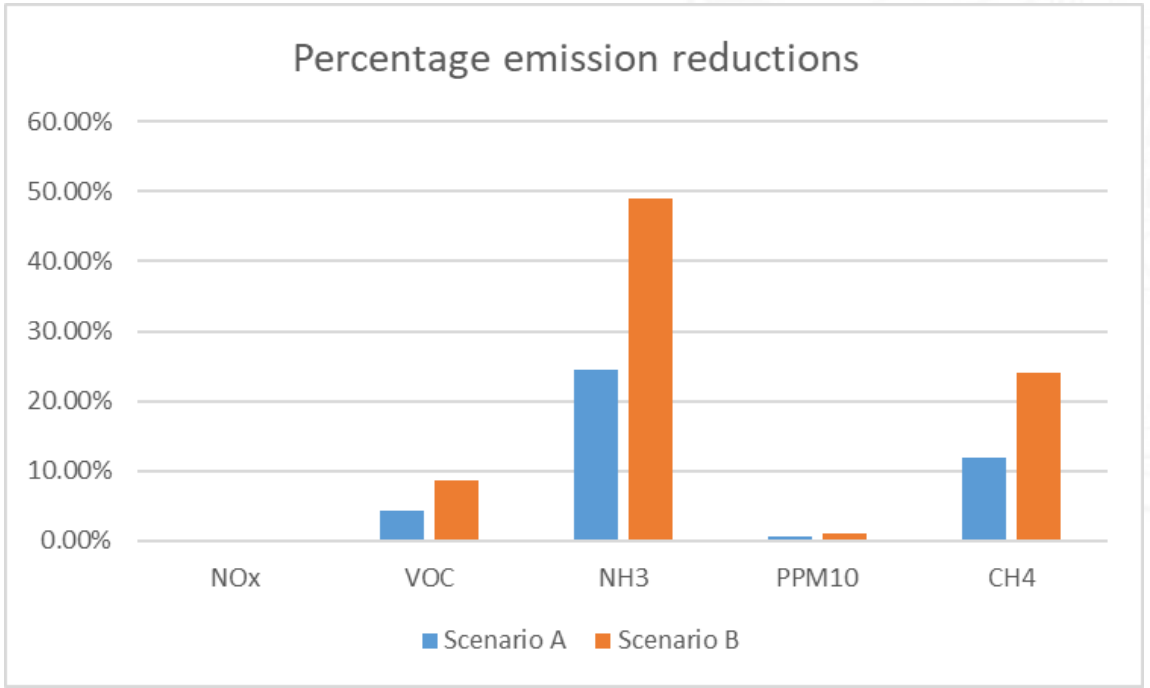
Scenarios

- **base case**: corresponding to the Current Legislation (CLE) scenario expected by the European Legislation for the year 2020;
- **Scenario A**: a 25% reduction of the breeding activities over the domain;
- **Scenario B**: a 50% reduction of the breeding activities over the domain.



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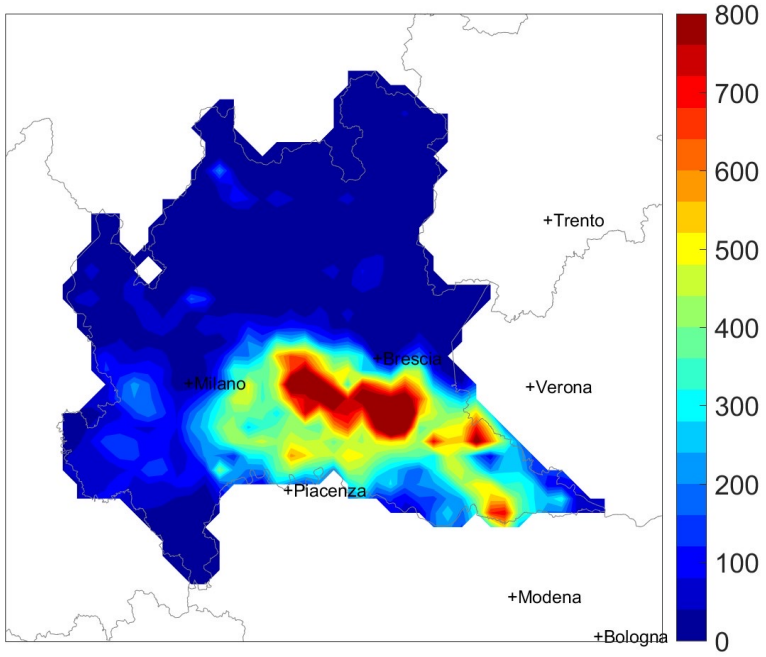
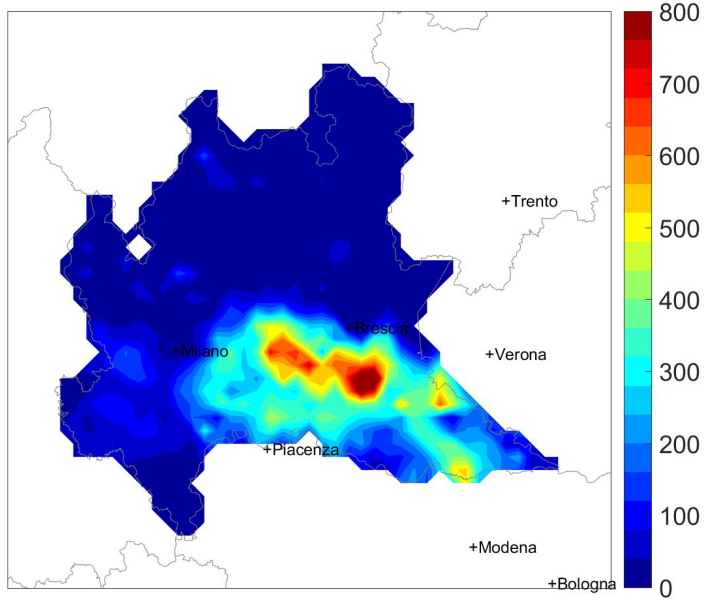
NH_3 emissions [t/year]

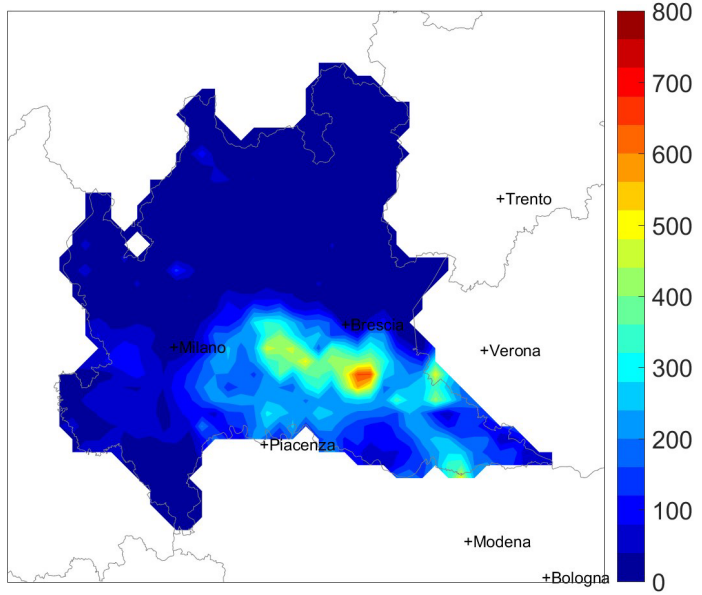


CLE 2020

Scenario A



Scenario B



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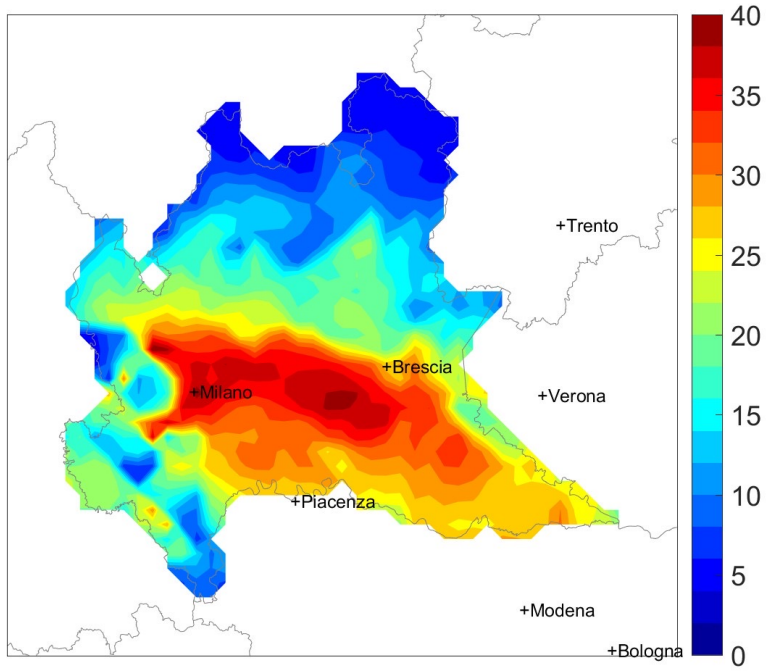
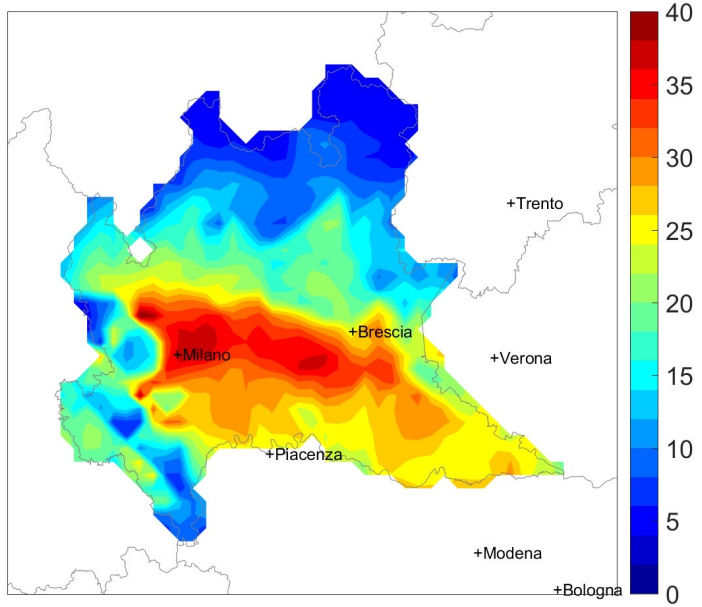
PM_{10} concentrations [µg/m³]

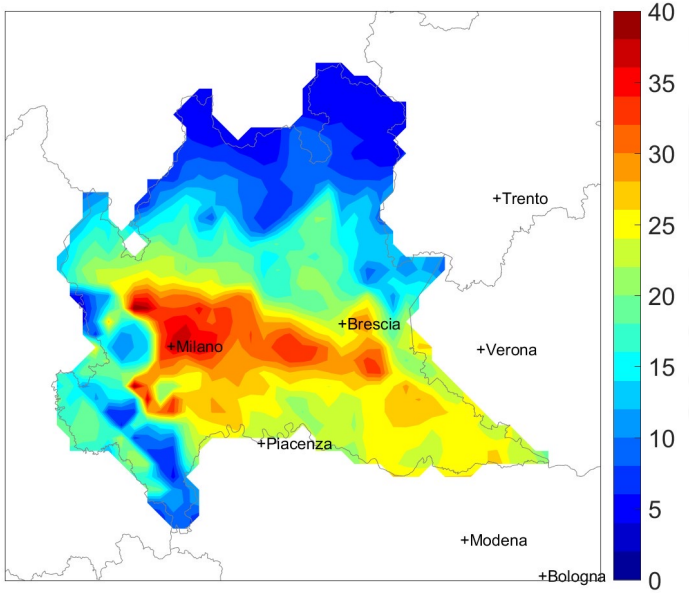


CLE 2020

Scenario A



Scenario B



Max PM10 reduction [µg/m³]	
Scenario A	5.34
Scenario B	10.04

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Health impacts

	Long term PM_{10} exposure (on total population)		Metabolic effects (on 50-65 years old people reducing protein consumption)	
	Total avoided YLL per year [years]	Total avoided premature deaths per year [-]	Total avoided YLL per year [years]	Total avoided premature deaths per year [-]
Scenario A	3622	724	9212	815
Scenario B	7477	1495		

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Social acceptability

3 clusters identified:

- Cluster 1: highly sensitive to the cost of a policy measure. **Not interested in policies implying a decrease in meat and dairy products consumption** even if this would be compensated by a reduction in premature deaths
- Cluster 2: **might change her/his dietary habits only after compensation**, (reduction of premature deaths) and are favourable to the "polluters pay more" principle.
- Cluster 3: highly e positively **sensitive to a dietary change**, also if this would imply higher costs

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Social acceptability

Changes in animal protein consumption among the clusters

	Base scenario	Scenario A	Scenario B
Cluster 1	43%	43%	43%
Cluster 2	29%	25%	22%
Cluster 3	28%	7%	–15%
Total animal protein consumption	100%	75%	50%

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M. Volta, E. Turrini, C. Carnevale, E. Valeri, V. Gatta, P. Polidori, M. Maione,
Co-benefits of changing diet. A modelling assessment at the regional scale integrating social acceptability, environmental and health impacts,
Science of The Total Environment, 756, 2021,143708, ISSN 0048-9697
doi 10.1016/j.scitotenv.2020.143708.
https://www.sciencedirect.com/science/article/pii/S0048969720372399

Active mobility

Health impacts

INDIRECT

DIRECT

Indirect impacts:

- Health impacts and external costs due to PM_{10} exposure
- increased breathing

Direct impacts:

- Increased physical activity (WHO-HEAT)

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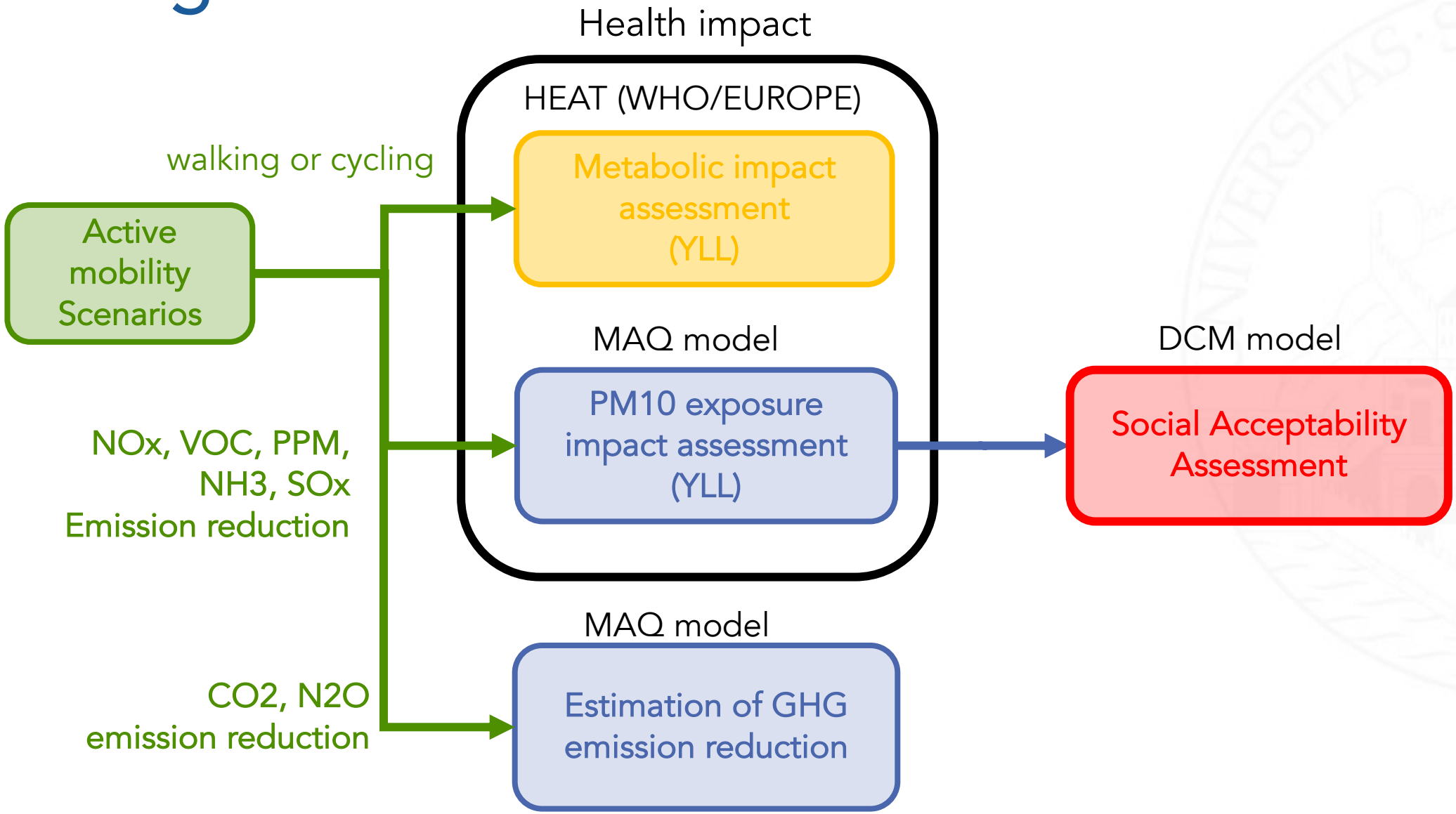
Modelling scheme



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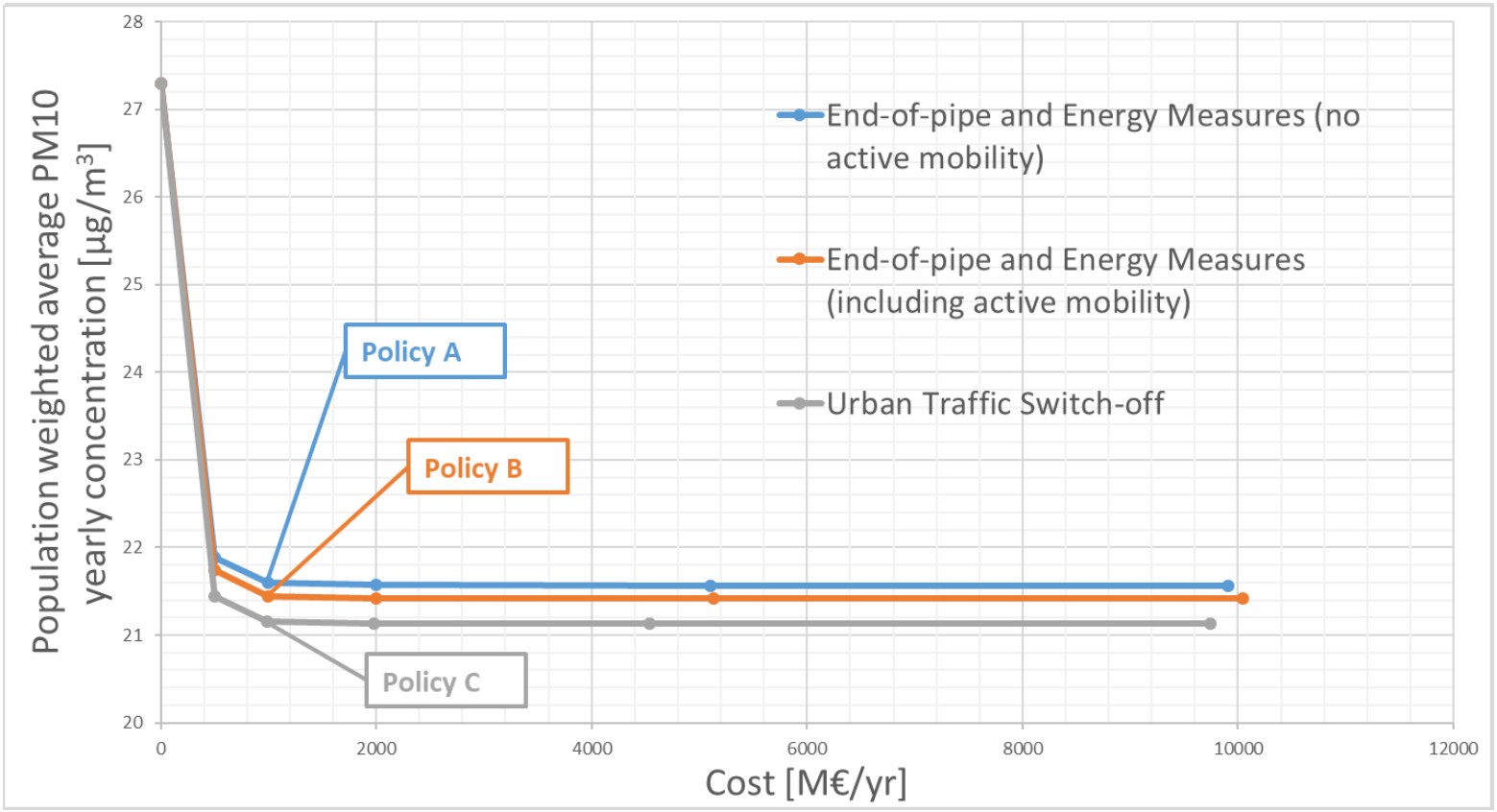
Efficient policies



Costs, PM10 yearly mean concentration reduction and external costs for Policies A, B and C with respect to CLE scenario

Scenario	Cost Over CLE [M€/year]	Population weighted PM10 yearly conc. [µg/m3]	Yearly AOT40 sum [µg/m3*h]	CO2 [kton/year]	CH4 [kton/year]	N20 [kton/year]
CLE 2020	0	27.29	95647	29698	280.73	0.45491
Policy A	1000	21.59	99067	28554	282.75	0.21773
Policy B	1000	21.446	98941	28267	281.38	0.2099
Policy C	1000	21.15	98007	27613	280.19	0.27385

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Active mobility costs

	Strategy	Min/day	Communication Cost [M€/PJ]	Time Cost [M€/PJ]
	Commute by feet	20 walk	0.3300	7.35
	Commute by bike	40 bike	0.3300	9.18
	Commute by bus	20 walk	0.3300	3.78

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Active mobility scenarios

	Scenario1	Scenario 2
Commuters [M]	1.3	2
Km/(commuter*year)	6000	6000
Δ Activity Level (Passenger cars)	-4%	-8%

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Direct and indirect health impacts

				Scenario 1		Scenario 2	
		CLE2020	Scenario A				
Commuters adopting AM	[Millions of people]	-	-	0.33	0.82	0.66	1.65
Indirect average per capita YLL	[months per capita]	7.86	6.21	6.21		6.20	
Direct impact per commuter (YLL)	[months per commuter]	-	-	-49.72	-24.01	-49.72	-24.01
Direct impact per commuter (YLL)		-	-	5.14	0.54	5.14	0.54

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Project outputs

- Scientific papers
- Projects
- International Organization: EU FAIRMODE, UNECE-TFIAM, ECA
- Newspapers/citizen science

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Thank you

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