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China and Europe**

Deliverable: DEL 6.1

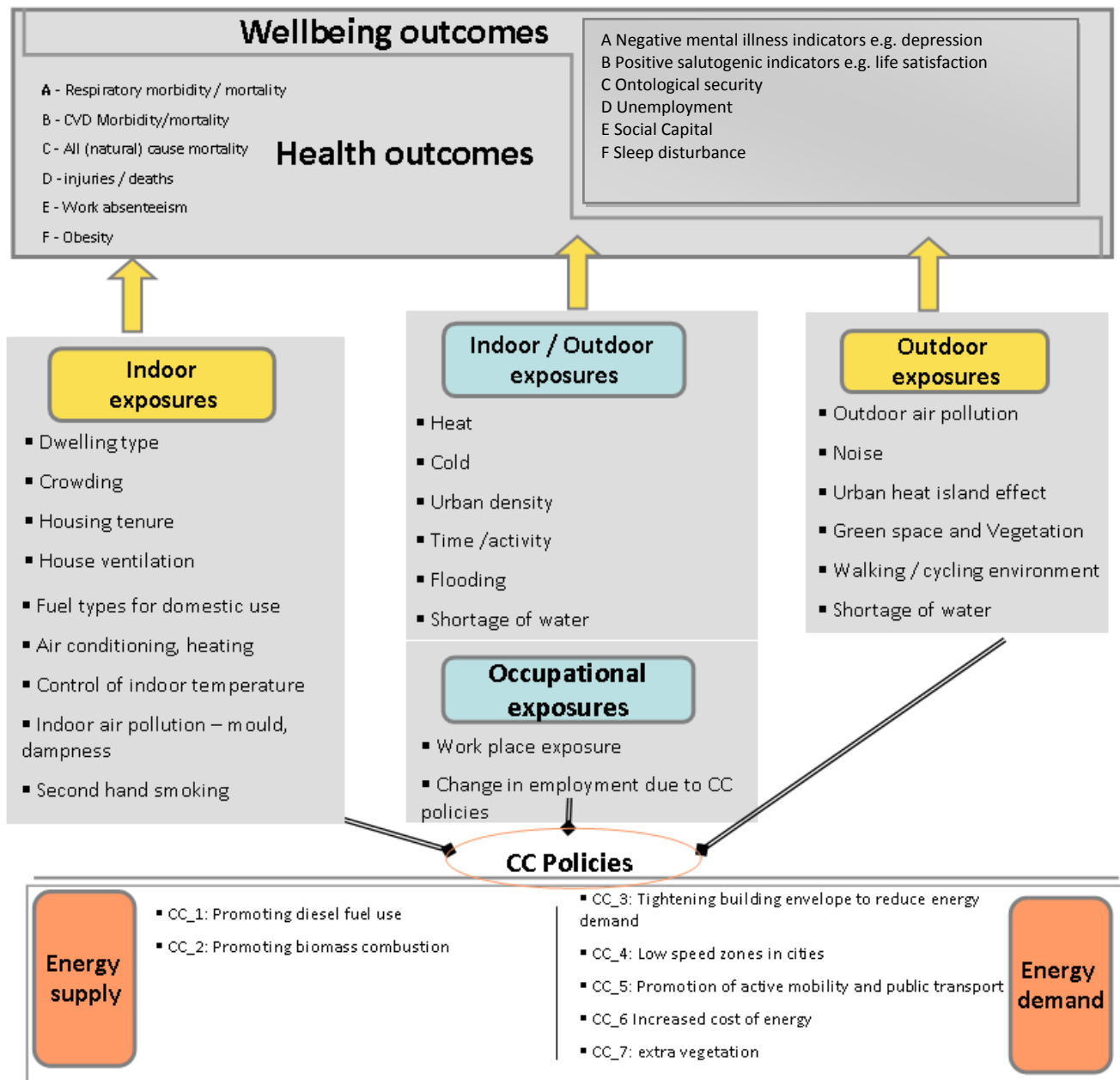
Title: Definition of the elements to be included in the study

Author name(s)/Affiliations: WHO, IOM, UExeter, Swiss TPH, THL, UStutt

URGENCHE / WP6 DEL 6.1

This deliverable describes the parameters to be considered in URGENCHE for estimation of health and well-being impacts of GHG policies. It is intended to guide participating cities in identifying and compiling the data that will be needed to carry out the health assessments within the scope of the project¹.

The overall project objective is to develop a modelling platform and a related database for urban impact assessment. The modelling platform can be used for general or detailed assessments, depending on the availability of data. An overview of the health and well being platform is presented in the figure below.



The document is organized in two parts:

- 1) Exposure, health & wellbeing: Parameters to be included in the assessment – Table A – Health outcomes
- 2) Exposure, health & wellbeing: Parameters to be included in the assessment – Table B – Wellbeing outcomes.

Each part is preceded by a summary table, indicating the lead contributing partner(s) responsible for specific exposure working areas, the link (where relevant) to local policies for climate change mitigation/adaptation, and related health outcomes. For each area of work, responsible partners have compiled a form describing the main attributes of the proposed exposure indicators, including its relation to health outcomes and the strength of the evidence for the association between the exposure indicator and listed outcomes.

The following list of exposure areas is expected to cover all the relevant issues for urban policies. In principle, it would be preferable to obtain data for all topics, as this would allow the creation of a data library that could be flexibly used to address assessment needs and issues across the full spectrum of exposures. However, this is not strictly necessary, as, depending on the case study context, subsets of the variables may suffice to produce the desired assessments. The topics under consideration in URGENCHE, both for health outcomes and wellbeing, include:

- Indoor exposure
 - House ventilation /Air Conditioning (AC)
 - Mould, dampness
 - Fuel types for domestic use
 - Second hand smoking
 - Work place exposure
 - Density
 - Density of buildings
 - Overcrowding - indoor
- Outdoor exposure
 - Outdoor air pollution (PM, O3, NO2)
 - Mode of transport- change from private motorised to public and/or active modes
 - Proximity to traffic & industry
 - Noise
 - Green space & vegetation
 - Walking / cycling environment
 - Time /activity
- Indoor/Outdoor exposure
 - Temperature
 - Heat (indoor, outdoor)
 - Urban heat island effect
 - Cold (indoor, outdoor)
 - Water

- Shortage of water
- Flooding

Specific topics related to wellbeing are also:

- 1) Housing type/flats vs houses
- 2) Housing tenure
- 3) Vegetation
- 4) Employment changes due to Climate Change policies
- 5) Access to resources

Other topics were also considered, for their potential interest and connection with health outcomes and well being. For example, 1) Indoor air pollution – chemicals; 2) Air Conditioning in neighbourhood; 3) Outdoor air (bio) allergens; 4) Street lighting.

The eventual inclusion of these topics is linked to the availability of very specific data and their importance is linked to potential impact to be considered within a case study. For example, street lighting can be important for pedestrians/cyclists safety and for the security of vulnerable road users and those who are afraid of street crime/assault. Data needed in this case are: Neighbourhood
A. % of badly lit streets (of total streets) B. % of days with badly lit streets.

Topics not considered, but of potential interest, just for well being include: 1) Work place exposure; 2) Graffiti, vandalism

URGENCHE WP6 - Exposure, health & wellbeing: Parameters to be included in the assessment – Table A – Health outcomes

#	Exposure	Link with CC policy	Leader (contributor)	Applies at what level? Metric/indicators	Health outcomes (see forms below *)					
					Respiratory morbidity / mortality (A)	CVD Morbidity/mortality (B)	All (natural) cause mortality (C)	injuries / deaths (D)	Work absenteeism (E)	Obesity (F)
1	Indoor AP – mould, dampness	CC_3	IOM	Household	WHO 1A					
2	Heat (indoor, outdoor)		WHO		WHO 2A	WHO 2B	WHO 2C		WHO 2E	
3	Cold (indoor, outdoor)		WHO		WHO 3A	WHO 3B	WHO 3C	WHO 3D	WHO 3E	
4	Crowding (indoor)		WHO	Household Nr resident people/room	WHO 4A					
5	Urban density	CC_5	WHO	Urban Nr resident per km2	WHO 5A					
6	Second hand smoking 1		IOM	Living with a smoker	IOM 6A	IOM 6B	IOM 6C			
7	Second hand smoking 2		IOM	PM 2.5	IOM 7A	IOM 7B	IOM 7C			
8	Fuel types for domestic use 1		IOM	Presence of a gas cooker	IOM 8A					
9	Fuel types for domestic use 2		IOM	PM 2.5	IOM 9A	IOM 9B	IOM 9C			
10	Work place exposure 1		IOM	Chemical and Physical		IOM 10.1B	IOM 10.1C		IOM 10.1E	
11	Work place exposure 2		IOM	Organisational			IOM 11.2C		IOM 11.2E	IOM 11.2F
12	Outdoor AP (PM, O3, NO2)	CC_1-2-5	IOM	City/neighbourhood A. Yearly PM average concentrations B. SOMOx for O3	WHO12.A	WHO 12.B	WHO 12.C		IOM 12.E	
13	Noise	CC_4 and 5	WHO/IOM			WHO 13B				
14	Urban heat island effect		WHO	Neighbourhood	WHO 14A	WHO 14B	WHO 14C		WHO 14E	
15	Green space		IOM				IOM 15C			xx
16	Walking / cycling	CC_4 CC_5		Minutes/day by bike or by foot (from travel surveys) for all transport purposes in adults; else Km/day	WHO 16A	WHO 16B	WHO 16C	WHO 16D	WHO 16E	Evidence available but limited, suggest

				on foot or by bike						not to include
17	Time /activity		WHO / Exeter	Time or space/time activity patterns for a population sample	WHO 17					
18	Shortage of water		WHO	<i>Neighbourhood</i>	WHO 18A		WHO 18C	WHO 18D	WHO 18E	
19	Flooding		WHO	<i>Neighbourhood</i>	WHO 19A		WHO 19C	WHO 19D	WHO 19E	

Climate Change (CC) policies that can be considered by cities (ES – energy supply; ED – energy demand):

CC_1: Promoting diesel fuel use (ES)

CC_2: Promoting biomass combustion (ES)

CC_3: Tightening building envelope to reduce energy demand (ED)

CC_4: Low speed zones in cities (ED)

CC_5: Promotion of active mobility and public transport (ED)

CC_6 Increased cost of energy (ED)

CC_7: extra vegetation (ED)

* each cell refers to a small form. (LEAVE BLANK IF NOT RELEVANT/APPLICABLE)

Legend to the forms below

- **FORM #**
- **SUBJECT [TITLE]**
- **RESPONSIBLE [AUTHOR/ORGANISATION]**

- **EXPOSURE INDICATOR [Description of the variable]**

- **DATA NEEDED [Description of the data that should be provided by URGENCHE cities]**

- **LEVEL AT WHICH IT APPLIES: [Specifies whether the indicator applies to city, neighbourhood, household or individual level]**

- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES IN RELATION TO THE INDICATOR**
 - **STRENGTH OF EVIDENCE: ADEQUATE / LIMITED / INADEQUATE [select one]**
 - **IMPACTS QUANTIFIABLE? (yes/no)**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY [yes/no, comment]**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? [what level/no level]**

- **HEALTH EFFECTS OF LONG-TERM EXPOSURES IN RELATION TO THE INDICATOR**
 - **STRENGTH OF EVIDENCE: ADEQUATE / LIMITED / INADEQUATE [select one]**
 - **IMPACTS QUANTIFIABLE? [yes/no]**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY [yes/no, comment]**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? [what level/no level]**

- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION [comment]**

FILLED FORMS

FORM WHO 1A

- **SUBJECT: INDOOR AP, MOULD, DAMPNESS and RESPIRATORY MORBIDITY/MORTALITY**
- **RESPONSIBLE AUTHOR/ORGANISATION: WHO**
- **EXPOSURE INDICATOR: PRESENCE OF MOULD AND DAMPNESS IN THE HOME (YES/NO)**
- **DATA NEEDED: proportion of households with dampness and mould (e.g from a household survey)**
- **LEVEL AT WHICH IT APPLIES: HOUSEHOLD**
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES - N/A**
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? (yes/no)**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY (yes)**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? (no safe level)**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment) ALL POPULATION**

FORM WHO 2A/B/C

- **SUBJECT: HEAT (INDOOR/OUTDOOR)**
- **RESPONSIBLE AUTHOR/ORGANISATION: WHO**
- **EXPOSURE INDICATOR: PROPORTION OF PERSON-DAYS IN HEAT-WAVES IN A SPECIFIC LOCATION IN THE SUMMER.** Heat-wave defined as days with maximum daily temperature for at least three consecutive days above the temperature threshold value defined as the 95th percentile of the temperature reference period. (T₉₅).
- **DATA NEEDED: Daily temperatures, Population**
- **LEVEL AT WHICH IT APPLIES: HOUSEHOLD/INDIVIDUAL (INDOOR), NEIGHBOURHOOD (OUTDOOR), BEHAVIOUR-DEPENDENT.**
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY YES** (between cities, years, heat-waves and non-heat-waves, housing situation)
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? TEMPERATURE THRESHOLD LOCATION-SPECIFIC**
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE: LIMITED**
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY YES** (comparing duration of heat-waves)
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? NO**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment)**
ELDERLY, SICK AND INFIRM, SOCIALLY ISOLATED, INFANTS, MEDICATION USE, HOSPITALIZATION, SPECIFIC OCCUPATIONS (e.g. outdoor professions), MASS EVENTS (e.g. marathons, concerts), PRE-EXISTING MEDICAL CONDITIONS

FORM WHO 3A/B/C/D/E

- **SUBJECT: COLD (INDOOR/OUTDOOR)**
- **RESPONSIBLE AUTHOR/ORGANISATION: WHO**
- **EXPOSURE INDICATOR: EXPOSURE TO COLD TEMPERATURES**, potential indicator example in the NHS Cold Weather Plan for England is mean temperature of 2°C for at least 48 hours; though the threshold would have to be location-specific.
- **DATA NEEDED: Mean daily temperature, Population**
- **LEVEL AT WHICH IT APPLIES: HOUSEHOLD/INDIVIDUAL (INDOOR), NEIGHBOURHOOD (OUTDOOR)**
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY YES** (between cities, years, cold-periods and non-cold-periods, housing situation)
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? YES, DEPENDING ON CIRCUMSTANCES**
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY** (yes/no, comment)
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?** The mean daily temperature at which mortality is lowest varies depending on the climate, being lower in cold and higher in warmer countries. This optimal temperature is +14°C in Finland, and +22 – +25 °C in the Mediterranean countries
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment)**
ELDERLY, SICK AND INFIRM, SOCIALLY ISOLATED, LOW SOCIOECONOMIC STATUS (POOR), OLD HOUSING STOCK, INFANTS, MEDICATION USE, SPECIFIC OCCUPATIONS (e.g. outdoor professions), IMMIGRANTS

FORM WHO 4A/B

- **SUBJECT: INDOOR CROWDING IN HOUSEHOLDS**
- **RESPONSIBLE AUTHOR/ORGANISATION: WHO**
- **EXPOSURE INDICATOR on Indoor crowding in households:** EXPOSURE TO CROWDED HOUSING CONDITIONS (person/room) EXCEEDING A GIVEN THRESHOLD: for developed cities, such as those covered by URGENCHE, a simple crowding threshold of max. 1 person per room could be used. Other crowding indices suggest e.g. 1.5 or 2 persons per room to be the threshold but this is very much affected by culture and developmental level. The exposure indicator thus has to be computed based on combined household size and dwelling size information (see below). It could also be an option to consider city-specific crowding data if available, especially as the data asked y the table below may not always be available.

- **DATA NEEDED:**

- 1) total % of crowded households in the city (based on local definition of crowding – please provide definition with the data)
- 2) total % of crowded households in city quarters (based on local definition of crowding)
- 3) detailed data to compute crowding levels across all cities should be added if available on city level (add number of households in each cell):

Households with...	1 room	2 rooms	3 rooms	4 rooms	5 rooms	6 rooms	7 rooms	8 rooms	9 rooms and more
1 person									
2 persons									
3 persons									
4 persons									
5 persons									
6 persons									
7 persons									
8 persons									
9 persons and more									

Note: “room” does EXCLUDE kitchens, bathrooms/toilets, corridor/floor space and small rooms with specific function (storage etc.) that are not suitable as bedroom. Rooms located in areas not counted as living floor space (e.g. basement, cellar, attic) are not to be included.

- **LEVEL AT WHICH IT APPLIES:** HOUSEHOLD/INDIVIDUAL (INDOOR)
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE:** LOW
 - **IMPACTS QUANTIFIABLE?** YES
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY** Not available
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?** Not available
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE:** ADEQUATE
 - **IMPACTS QUANTIFIABLE?** YES
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY** DIFFICULT THUS LOW PRIORITY
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?** TOO SUBJECTIVE FOR A FIXED SAFE LEVEL. HOWEVER, ONE COULD JUSTIFY USING THE CROWDING THRESHOLD OF 1 PERSON PER ROOM AS THE SAFE LEVEL.....
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment):** LOW-INCOME AND MARGINALIZED POPULATIONS GROUS WITH LESS CHANCES ON HOUSING MARKET

COMMENTS: Link to unintentional injuries should be considered. The direct link to CC interventions is to be developed with the cities

FORM WHO 5A/B/C/D

- **SUBJECT: RESIDENTIAL DENSITY IN CITY**
- **RESPONSIBLE AUTHOR/ORGANISATION: WHO**
- **EXPOSURE INDICATOR on RESIDENTIAL DENSITY IN CITIES:**
EXPOSURE TO DENSE URBAN RESIDENTIAL CONDITIONS (person/km²) EXCEEDING A GIVEN THRESHOLD: cities know exactly their territory and the number of citizens, enabling an assessment of density per km² or other units. This could provide an indication of the compactness of the city and the dimensions of urbanized space per person, especially relevant for travelling distances. If more detailed data are available this exposure indicator could also cover e.g. % of green space area, % of built / sealed land, % of industrial land; % of land for transport infrastructure, etc. Such information is often available for cities and could enable assessment of the effectiveness of urban form in relation to energy use, mobility parameters (modal split, total travel distance) urban heat island versus cooling by green spaces and so on.
- **DATA NEEDED:**
 - 1) size of city in km² and total number of residents
 - 2) Data on land surface categories of total city surface (% of green space area, % of built / sealed land, % of industrial land; % of land for transport infrastructure)
 - 3) supporting data on e.g. modal split, travel distances, energy consumption, urban temperatures, possibly transport injuries etc.
- **LEVEL AT WHICH IT APPLIES: URBAN SCALE, POSSIBLY BROKEN DOWN BY DISTRICTS**
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES - probably not applicable**
 - **STRENGTH OF EVIDENCE: N/A**
 - **IMPACTS QUANTIFIABLE? N/A**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY N/A**
 - **EVIDENCE OF A THRESHOLD OR "SAFE" LEVEL? N/A**
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE: POSSIBLY ADEQUATE** (It has not yet been possible to come to conclusions on level of adequacy of the evidence).
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY DIFFICULT BUT POSSIBLE**
 - **EVIDENCE OF A THRESHOLD OR "SAFE" LEVEL? TOO DIVERSE FOR DERIVING A SAFE LEVEL OF URBAN SIZE**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment): RESIDENTS OF MORE DENSE AND DEPRIVED NEIGHBOURHOODS AND DISTRICTS WILL OBVIOUSLY BE MOST AFFECTED**

COMMENTS: Urban density is also related to opportunities for active mobility and easiness in reaching leisure areas. The direct link to CC interventions can be made through many aspects such as energy consumption and mobility

FORM IOM 6A/B/C

- **SUBJECT: SECOND HAND SMOKE**
- **RESPONSIBLE AUTHOR/ORGANISATION: IOM**
- **EXPOSURE INDICATOR: LIVING WITH A SMOKER (yes, no)**
- **LEVEL AT WHICH IT APPLIES: HOUSEHOLD/INDIVIDUAL**
- **DATA NEEDED: Background rates specifically for non-smokers who live with a current smoker**
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES (Lower respiratory illness, wheeze, cough – children)**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY likely to be important exposure**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? No**
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES (Lung cancer, CHD – adults; SIDS, Asthma – children)**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY likely to be important exposure**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? No**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment)**

COMMENTS: N/A

FORM IOM 7A/B/C

- **SUBJECT: SECOND HAND SMOKE**
- **RESPONSIBLE AUTHOR/ORGANISATION: IOM**
- **EXPOSURE INDICATOR: PM2.5**
- **DATA NEEDED: Background rates will be needed for non-smokers who live with a smoker**
- **LEVEL AT WHICH IT APPLIES: HOUSEHOLD/INDIVIDUAL**
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES** (Lower respiratory illness – children)
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY** likely to be important exposure
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? No**
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES** (Cardiopulmonary mortality, chronic bronchitis - adults)
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY** likely to be important exposure
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? No**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment)**

COMMENTS: High levels of PM2.5 associated with SHS exposure mean that non-linearity of the ERF needs to be taken into account. Because of this, there are a limited number of health endpoints which can be quantified.

FORM IOM 8A

- **SUBJECT: FUEL TYPE FOR DOMESTIC USE**
- **RESPONSIBLE AUTHOR/ORGANISATION: IOM**
- **EXPOSURE INDICATOR: PRESENCE OF A GAS COOKER (yes,no)**
- **DATA NEEDED: TO BE SPECIFIED**
- **LEVEL AT WHICH IT APPLIES: HOUSEHOLD/INDIVIDUAL**
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES (Respiratory morbidity – children)**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? No**
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE:**
 - **IMPACTS QUANTIFIABLE?**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment)**

COMMENTS: There may be other relevant health effects, e.g. in relation to burns.

FORM IOM 9A/B/C

- **SUBJECT: FUEL TYPES FOR DOMESTIC USE**
- **RESPONSIBLE AUTHOR/ORGANISATION: IOM**
- **EXPOSURE INDICATOR: PM2.5**
- **DATA NEEDED: Proportion of population (adults/children) living in homes heated by specific fuel types**
- **LEVEL AT WHICH IT APPLIES: HOUSEHOLD/INDIVIDUAL**
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES** (Lower respiratory illness, wheeze, cough – children; RADs – adults; injuries (burns))
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY** unlikely to lead to large population health effects
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? No**
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES** (All-cause mortality, Respiratory and cardiovascular hospital admissions – all ages)
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY** unlikely to lead to large population health effects
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? No**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment)**

COMMENTS: PM2.5 levels in Scotland and Ireland due to solid fuel burning for heating are not much above background and < 10% of the population are exposed so the health effects are likely to be low. Low PM2.5 levels mean there are no issues with non-linearity in the Exposure Response Function and so more health endpoints can be considered. Population exposed can be considered representative of the general population i.e. can use the general population background rates.

FORM IOM 10A/B/C/E

- **SUBJECT: WORKPLACE EXPOSURE (Chemical and Physical)**
- **RESPONSIBLE AUTHOR/ORGANISATION: IOM**
- **EXPOSURE INDICATOR: Various (see Comment)**
- **DATA NEEDED: The workplace exposures to be considered will depend on specific policies. Until these policies are known it is not possible to define the data needs,**
- **LEVEL AT WHICH IT APPLIES: OCCUPATIONAL GROUP/INDIVIDUAL**
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE:**
 - **IMPACTS QUANTIFIABLE?**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?**
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment)**

COMMENTS: Health effects of long-term exposures will dominate over those of short-term exposures.

There are too many potential workplace exposures to be specific on effects until we know more about what policies may be implemented.

FORM IOM 11C/E/F

- **SUBJECT: WORKPLACE EXPOSURE (Organisational issues, travel to work, workplace health promotion/improvement)**
- **RESPONSIBLE AUTHOR/ORGANISATION: IOM**
- **EXPOSURE INDICATOR: Various**
- **DATA NEEDED: The workplace exposures to be considered will depend on specific policies. Until these policies are known it is not possible to define the data needs,**
- **LEVEL AT WHICH IT APPLIES: OCCUPATIONAL GROUP/INDIVIDUAL**
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE:**
 - **IMPACTS QUANTIFIABLE?**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?**
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment)**

COMMENTS: Health effects of long-term exposures will dominate over those of short-term exposures. There are too many potential workplace exposures to be specific on effects until we know more about what policies may be implemented.

FORM WHO 12A/B/C

- **SUBJECT: OUTDOOR AP (PM, O3, NO2)**
- **RESPONSIBLE AUTHOR/ORGANISATION: WHO**
- **EXPOSURE INDICATOR:** Fixed site measurements, yearly average concentrations (PM10 and PM2.5), SOMOx (O3).
- **DATA NEEDED:** Daily concentration data for PM10 and PM2.5. Eight hour mean data for Ozone.
- **LEVEL AT WHICH IT APPLIES:** CITY- REGION
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE:** ADEQUATE
 - **IMPACTS QUANTIFIABLE?** YES
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY** yes
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?** no threshold
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE:** ADEQUATE
 - **IMPACTS QUANTIFIABLE?** YES
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY** yes
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?** no threshold
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment)**
URBAN POPULATIONS, CHILDREN, ELDERLY, LOW SOCIOECONOMIC STATUS

FORM IOM 12E

- **SUBJECT: OUTDOOR AIR POLLUTION**
- **RESPONSIBLE AUTHOR/ORGANISATION: IOM**
- **EXPOSURE INDICATOR: Particulate Matter (PM₁₀, PM_{2.5}) + others**
- **DATA NEEDED: Levels of PM; possibly time-activity patterns of individuals**
- **LEVEL AT WHICH IT APPLIES: INDIVIDUAL**
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE: LIMITED**
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY Moderate priority**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? No**
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment)**

FORM WHO 13/B

- **SUBJECT: NOISE**
- **RESPONSIBLE AUTHOR/ORGANISATION: WHO/IOM**
- **EXPOSURE INDICATOR: Day/Evening/Night outdoor noise level (dB)**
- **LEVEL AT WHICH IT APPLIES: NEIGHBOURHOOD/CITY**
- **DATA NEEDED: Day/Evening/Night outdoor noise level (dB), Population distribution**
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?**
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? YES (CVD, tinnitus, cognition, sleep, annoyance)**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment)**
URBAN POPULATIONS

FORM WHO 14A/B/C

- **SUBJECT: URBAN HEAT-ISLAND EFFECT**
- **RESPONSIBLE AUTHOR/ORGANISATION: WHO**
- **EXPOSURE INDICATOR: DIFFERENCE IN URBAN AND SURROUNDING RURAL TEMPERATURE**
- **LEVEL AT WHICH IT APPLIES: NEIGHBOURHOOD**
- **DATA NEEDED: DAILY AVERAGE TEMPERATURES FOR THE CITIES AND SURROUNDING RURAL AREAS**
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY (yes/no, comment)**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? (what level/no level)**
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY (yes/no, comment)**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? (what level/no level)**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment)**
SAME AS FOR 3.A/B/C BUT SPECIFICALLY URBAN POPULATIONS, POORER AREAS, LACK OF GREEN SPACES, OVERCROWDING

FORM IOM 15C

- **SUBJECT: GREENSPACE**
- **RESPONSIBLE AUTHOR/ORGANISATION: IOM**
- **EXPOSURE INDICATOR: Various**
- **LEVEL AT WHICH IT APPLIES: OCCUPATIONAL GROUP/INDIVIDUAL**
- **DATA NEEDED: Location of greenspace in cities, proportion of population with access to good quality greenspace**
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE:**
 - **IMPACTS QUANTIFIABLE?**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?**
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE: LIMITED**
 - **IMPACTS QUANTIFIABLE? Possibly**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment)**

COMMENTS: There is some evidence on relationship between Greenspace and traditional health outcomes and this is a place holder for now. We hope to have more definitive information soon. There is also a link between green spaces and opportunities for physical activity.

FORM WHO 16C

- **SUBJECT: WALKING AND CYCLING**
- **RESPONSIBLE AUTHOR/ORGANISATION: WHO/EXETER**
- **EXPOSURE INDICATOR: TIME (or) SPACE/TIME PATTERNS OF THE POPULATION. TIME SPENT INDOOR AND OUTDOOR, AT HOME, AT WORK, TRAVELLING AND FOR LEISURE. Time-activity patterns can be used in conjunction with location-specific estimates.**
- **DATA NEEDED: TIME AND ACTIVITY BY A REPRESENTATIVE SAMPLE OF THE POPULATION (e.g. results of questionnaires collecting activities every 15 minutes; GPS based collection of data)**
- **LEVEL AT WHICH IT APPLIES: WHOLE POPULATION (AND SUBGROUPS)**
- **HEALTH EFFECTS OF EXPOSURES (N/A)**
 - **STRENGTH OF EVIDENCE: N/A**
 - **IMPACTS QUANTIFIABLE? (N/A)**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY (YES, reducing exposure to air pollutants or other risks can serve as a cost-effective way of lessening the health effects)**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? (N/A)**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (Possibly generating detailed exposure profiles for vulnerable groups (e.g. children, elderly, people walking or cycling can be linked to various policies (e.g. minimizing exposures could involve improved ventilation, changes in planning, such as traffic zoning or the siting of polluting industries)**

FORM WHO 17

- **SUBJECT: TIME ACTIVITY**
- **RESPONSIBLE AUTHOR/ORGANISATION: WHO/EXETER**
- **EXPOSURE INDICATOR: TIME (or) SPACE/TIME PATTERNS OF THE POPULATION. TIME SPENT INDOOR AND OUTDOOR, AT HOME, AT WORK, TRAVELLING AND FOR LEISURE.** Time-activity patterns can be used in conjunction with location-specific estimates.
- **DATA NEEDED: TIME AND ACTIVITY BY A REPRESENTATIVE SAMPLE OF THE POPULATION** (e.g. results of questionnaires collecting activities every 15 minutes; GPS based collection of data)
- **LEVEL AT WHICH IT APPLIES: WHOLE POPULATION (AND SUBGROUPS)**
- **HEALTH EFFECTS OF EXPOSURES (N/A)**
 - **STRENGTH OF EVIDENCE: N/A**
 - **IMPACTS QUANTIFIABLE? (N/A)**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY (YES, reducing exposure to air pollutants or other risks can serve as a cost-effective way of lessening the health effects)**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? (N/A)**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION** (Possibly generating detailed exposure profiles for vulnerable groups (e.g. children, elderly, people walking or cycling can be linked to various policies (e.g. minimizing exposures could involve improved ventilation, changes in planning, such as traffic zoning or the siting of polluting industries)
- **COMMENT:** The idea is to work with the purpose of an integrated exposure approach (i.e. across all settings, Indoor/Outdoor and Occupational exposures, along the whole day)

FORM WHO 18 A/B/C

- **SUBJECT: SHORTAGE OF WATER** [i.e. drought]
- **RESPONSIBLE AUTHOR/ORGANISATION:** WHO
- **EXPOSURE INDICATOR:** WATER SHORTAGE INDICATOR (?)
- **DATA NEEDED:** TO BE SPECIFIED
- **LEVEL AT WHICH IT APPLIES:** NEIGHBOURHOOD
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE:** ADEQUATE / LIMITED / INADEQUATE (inadequate evidence on droughts)
 - **IMPACTS QUANTIFIABLE?** YES
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY** (yes, but difficult due to different availability of data and various locations)
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?** YES (minimal safe water availability, both in drought AND flood conditions)

Health outcomes not adequately expressed in table. Observed health outcomes for water shortage: malnutrition, eye/skin infection, diarrhoea and gastrointestinal infections...
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE:** ADEQUATE / LIMITED / INADEQUATE (CAN HAVE LONG-TERM HEALTH EFFECTS OF SHORT-TERM EXPOSURE)
 - **IMPACTS QUANTIFIABLE?** YES
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY** (yes, but difficult due to different availability of data and various locations)
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?** YES (minimum quantity of water provided should be 15 – 20 litres / person / day to allow for drinking and essential hygiene activities, both in drought AND flood conditions)
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment)**
 - (i) population living in water shortage zones (number and percentage)

The two sub-indicators below deal with socio-economic aspects such as

 - (ii) proportion of elderly living in water shortage zones
 - (iii) proportion of population in poverty living in water shortage zones.

There is a difference in a vulnerability to drought, and being vulnerable to the health effects of drought.

Comment: waterborne disease were not initially considered because they are indirect effect of climate change related exposure. If it is the case, they can included.

- **SUBJECT: FLOODING**
- **RESPONSIBLE AUTHOR/ORGANISATION: WHO**
- **EXPOSURE INDICATOR: POPULATION WHICH HAS BEEN SUBJECT TO ACTUAL FLOODING IN SPECIFIC AREA DURING A CALENDAR YEAR.** Flood defined a temporary covering by water of land normally not covered by water. This shall include floods from rivers, mountain torrents, flash floods, caused by extreme precipitation in a short time, direct runoff over land causing local flooding in areas not previously associated with natural or manmade water courses – so-called pluvial flooding. It shall also include Mediterranean ephemeral water courses, and floods from the sea in coastal areas, and may exclude floods from sewerage systems. Population subject to actual flooding in specific area is determined using spatial analysis supported appropriate spatial resolution data for population estimates and spatial polygons of the occurring floods.
- **DATA NEEDED:** Statistics on population affected by flooding
- **LEVEL AT WHICH IT APPLIES: NEIGHBOURHOOD**
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE:** ADEQUATE / LIMITED / INADEQUATE (adequate evidence for flooding exists)
 - **IMPACTS QUANTIFIABLE?** YES
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY** (yes, but difficult due to different availability of data and various locations)
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?** YES (minimal safe water availability, both in drought AND flood conditions)

Health outcomes not adequately expressed in table. Observed health outcomes for flooding: drowning, injuries, hypothermia, CVD, water/food/vector-borne diseases, gastrointestinal infections, skin infections, mental health problems.
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE:** ADEQUATE / LIMITED / INADEQUATE (CAN HAVE LONG-TERM HEALTH EFFECTS OF SHORT-TERM EXPOSURE)
 - **IMPACTS QUANTIFIABLE?** YES
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY** (yes, but difficult due to different availability of data and various locations)
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?** YES (minimum quantity of water provided should be 15 – 20 litres / person / day to allow for drinking and essential hygiene activities both in drought AND flood conditions)
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment)**
 - (i) population living in flood hazard zones (number and percentage)

The two sub-indicators below deal with socio-economic aspects such as

 - (ii) proportion of elderly living in flood hazard zones
 - (iii) proportion of population in poverty living in flood hazard zones.

There is a difference in a vulnerability to flooding, and being vulnerable to the health effects of being flooded.

URGENCE WP6 - Exposure, health & wellbeing: Parameters to be included in the assessment – Table B – Wellbeing outcomes 19/02/2013

	Exposure	Link with CC policy	Negative indicators Mental Health Self-assessed health Depression A	Positive indicators Wellbeing Life satisfaction (B) (positive measures of wellbeing)	Ontological security: children in care, C	Unemployment (D)	Soc capital, leisure , cultural, sport activities (E)	Sleep disturbance (F)
			A lot of literature of varying quality and lots of measures used – how comparable are they???	Less literature on positive effects but there may be more to find	Very little literature – probably due to the silo-ing of research money and small numbers	little found in the academic literature – some in grey literature & generally poor quality	little found in the academic literature – some in grey literature & generally poor quality	
1	Indoor AP - chemicals							
2	Indoor AP – mould, dampness	CC_A	2 A Likely to be possible to develop link functions	2B No evidence found yet				
3	Heat	CC_A		3B No evidence found yet –maybe need to work with Basel on this				
4	Cold	CC_A	4A Likely to be possible to develop link functions	4B No evidence found yet				
5	Crowding (indoor)	CC_B	5A Weak evidence unsure if enough for link functions	5B No evidence found yet	5C Weak evidence unsure if enough for link functions		5E No evidence found yet	
6	House ventilation /AC	CC_A						
7	AC in neighbourhood							
8	<i>Second hand smoking</i>		<i>8A Intermediate process so not looked at</i>	<i>8BIntermediate process so not looked at</i>				
9	Fuel types for domestic use	CC_A				9D Some %s which may be possible to work with cities		
10	Work place exposure							
11	Outdoor AP (PM, O3, NO2)	CC_C	11A Some link functions already available					
12	Outdoor air (bio) allergens							
13	Noise	CC_A	13A Noise perception is very subjective and direction of causation is unclear	13B Noise perception is very subjective and direction of causation is unclear				OIM 13 F
14	Street lighting							
15	Urban heat island effect							
16	Housing type/flats vs houses	CC_B	16A Weak evidence unsure if enough for link functions	16B No evidence found yet	16C Weak evidence unsure if enough for link functions		16E Weak evidence unsure if enough for link functions	
17	<i>Housing tenure</i>	CC_B			<i>17GTangential so not looked at</i>		<i>17ETangential so not looked at</i>	
18	Green space	CC_B	18A Results are not presented in a way which would make them easy to	18B No evidence found yet			18E No evidence found yet	

	Exposure	Link with CC policy	Negative indicators Mental Health Self-assessed health Depression A	Positive indicators Wellbeing Life satisfaction (B) (positive measures of wellbeing)	Ontological security: children in care, C	Unemployment (D)	Soc capital, leisure , cultural, sport activities (E)	Sleep disturbance (F)
			develop link functions					
19	Trees	CC_B	19A Some evidence of trees and noise	19B No evidence found yet				
20	Walking / cycling environment	CC_B-C	20A Weak evidence –some percentages	20B Weak evidence –some percentages			20E Weak evidence –some percentages	
21	Proximity to traffic	CC_C				21D No evidence found yet		
22	Proximity to industrial sources	CC_A-B-C				22D Weak evidence –some percentages		
23	Time /activity	CC_A-B-C	23A No evidence found yet – maybe need to work with WHO on this –also Suzhou survey	23B No evidence found yet – maybe need to work with WHO on this–also Suzhou survey		23D No evidence found yet – maybe need to work with WHO on this–also Suzhou survey	23E No evidence found yet – maybe need to work with WHO on this–also Suzhou survey	
24	Modes of transport	CC_C	24A Very little evidence – some percentages–also Suzhou survey- benefits may come via whether public transport users/pedestrians do have higher levels of physical activity	24B Very little evidence –some percentages–also Suzhou survey			24E Very little evidence –some percentages–also Suzhou survey	
25	Graffiti, vandalism	CC_B	25A Tangential so not looked at	25B Tangential so not looked at	25C Tangential so not looked at			
26	Water management (shortage / excess)							
27	Change in employment due to CC policies	CC_A-C	27A Some %s which may be possible to work with cities	27B Some %s which may be possible to work with cities		27D Some %s which may be possible to work with cities		

CC policies:

CC_A: increased cost of energy.....

CC_B: extra vegetation....

CC_C: reduced private car use and change to public transport

FORM EXETER WELLBEING A-E,

- **SUBJECT: MEASURES OF WELLBEING**
- **RESPONSIBLE AUTHOR/ORGANISATION: EXETER**
- **EXPOSURE INDICATOR:** Noise, housing, transport, employment, proximity to industry
- **DATA NEEDED:**
 - Use of measures of wellbeing e.g. WHO-5 Wellbeing Index, self assessed health, psychological Riffs, Health Related Quality of Life, Annoyance
 - Surveys where these measures have already been collected in city, region or country wide e.g. European social survey
 - Our own survey?
-
- **LEVEL AT WHICH IT APPLIES: CITY**
- **HEALTH EFFECTS OF EXPOSURES (INSUFFICIENT EVIDENCE TO DIFFERENTIATE SHORT/LONG)**

STRENGTH OF EVIDENCE: HrQoL is a measure of mental and physical health and there are already studies showing it can constitute a good metric to capture the overall health effects of environmental stressors.

•‘Annoyance’ is a subjective measure that has been used in environmental studies including air pollution and noise, and has been incorporated into the environmental monitoring of many countries or regions. Results show that annoyance is an important public health and well-being issue because of the large numbers of people in cities affected by these issues. There are now several studies in Europe that propose ERFs for the association between annoyance and levels of air pollution that will be used to quantify impacts.

- **IMPACTS QUANTIFIABLE?**
- **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY**
- **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?**

WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION

FORM EXETER WELLBEING 1A

- **SUBJECT: MOULD, DAMPNESS and MENTAL HEALTH**
- **RESPONSIBLE AUTHOR/ORGANISATION: EXETER**
- **EXPOSURE INDICATOR: PRESENCE OF MOULD AND DAMPNESS IN THE HOME (YES/NO)**
- **DATA NEEDED:** Depression indicators: social surveys, prescriptions for antidepressants, suicides. Mould and dampness in the home (as for health)
- **LEVEL AT WHICH IT APPLIES: HOUSEHOLD**
- **HEALTH EFFECTS OF EXPOSURES (INSUFFICIENT EVIDENCE TO DIFFERENTIATE SHORT/LONG)**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? (yes)**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY (yes)**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? (no evidence)**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment)**

FORM EXETER WELLBEING 2A

- **SUBJECT: COLD HOUSING and MENTAL HEALTH**
- **RESPONSIBLE AUTHOR/ORGANISATION: EXETER**
- **EXPOSURE INDICATOR: LOW TEMPERATURE IN THE HOME (YES/NO)**
- **DATA NEEDED:** Depression indicators: social surveys, prescriptions for antidepressants, suicides.
Heating availability, ability of residents to afford to heat their homes, average temperature of homes, surveys of whether residents think their homes are too cold
- **Plans for heating and insulation in city owned housing, private housing stock and new build housing**
- **LEVEL AT WHICH IT APPLIES: HOUSEHOLD**
- **HEALTH EFFECTS OF EXPOSURES (INSUFFICIENT EVIDENCE TO DIFFERENTIATE SHORT/LONG)**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? (yes)**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY (yes)**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? (no evidence)**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION** (some cities will also be affected by too much heat but have not searched for this and may affect other health issues rather than depression)

FORM IOM WELLBEING 3F

- **SUBJECT: NOISE**
- **RESPONSIBLE AUTHOR/ORGANISATION: IOM**
- **EXPOSURE INDICATOR: Noise level (dB) from road, rail and air transport**
- **LEVEL AT WHICH IT APPLIES: INDIVIDUAL**
- **DATA NEEDED: TO BE SPECIFIED**
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE:**
 - **IMPACTS QUANTIFIABLE?**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?**
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES (Sleep disturbance, also annoyance)**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? YES**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment)**

FORM EXETER WELLBEING 4A

- **SUBJECT: DWELLING TYPE and MENTAL HEALTH**
- **RESPONSIBLE AUTHOR/ORGANISATION: EXETER**
- **EXPOSURE INDICATOR: FLOOR LEVEL, PERSONS PER ROOM, PRIVATE GARDEN**
- **DATA NEEDED:** Mental health indicators: social surveys, prescriptions for antidepressants, and anti anxiety drugs, suicides, psychiatric inpatients.
Dwelling type (house, apartment, low rise, high rise, floor level, persons per room, availability of private gardens
Plans for new dwellings in the short and long term
- **LEVEL AT WHICH IT APPLIES: HOUSEHOLD**
- **HEALTH EFFECTS OF EXPOSURES (INSUFFICIENT EVIDENCE TO DIFFERENTIATE SHORT/LONG)**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? (yes)**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY (yes)**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? (no evidence)**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION** (Complicated because those with mental health issues often live alone, not always consistent findings, few studies, difficult to differentiate from SES. The question to ask the cities is – is the housing type available going to be smaller, more crowded and have fewer gardens?)

FORM EXETER WELLBEING 5C

- **SUBJECT: HOUSING and CHILD MALTREATMENT/CHILDREN CARED FOR OUT OF HOME**
- **RESPONSIBLE AUTHOR/ORGANISATION: EXETER**
- **EXPOSURE INDICATOR: DWELLING TYPE, OVERCROWDING, HOMELESSNESS, HOUSING PROBLEMS.** Child maltreatment is the wellbeing outcome of being exposed to poor housing
- **DATA NEEDED:**
 - Children in orphanages/childrens' homes/looked after children/children known to social services/children at risk of maltreatment, homeless, housing turnover, security of tenure, population change (immigration and emigration)
 - Dwelling type (house, apartment, low rise, high rise, floor level, persons per room), Damp, cold housing
 - Plans for future housing of poorest inhabitants of cities – likelihood of deterioration or improvement in living conditions
- **LEVEL AT WHICH IT APPLIES: HOUSEHOLD**
- **HEALTH EFFECTS OF EXPOSURES (INSUFFICIENT EVIDENCE TO DIFFERENTIATE SHORT/LONG)**
 - **STRENGTH OF EVIDENCE: ADEQUATE (ish)**
 - **IMPACTS QUANTIFIABLE? (possibly)**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY (yes)**
 - **EVIDENCE OF A THRESHOLD OR "SAFE" LEVEL? (no evidence)**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION** (this applies to the most disadvantaged and vulnerable groups – have the cities taken into account how the most vulnerable populations will be housed in terms of overcrowding, housing problems, risk of homelessness as their appears to be some evidence that housing issues affect child maltreatment and chances of being taken into and remaining in care)

FORM IOM/Exeter 6-7

- **SUBJECT: GREENSPACE and VEGETATION**
- **RESPONSIBLE AUTHOR/ORGANISATION:** IOM/Exeter
- **EXPOSURE INDICATOR:** Various
- **LEVEL AT WHICH IT APPLIES:** OCCUPATIONAL GROUP/INDIVIDUAL
- **DATA NEEDED:** Location of greenspace in cities, proportion of population with access to good quality greenspace
- **HEALTH EFFECTS OF SHORT-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE:**
 - **IMPACTS QUANTIFIABLE?**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?**
- **HEALTH EFFECTS OF LONG-TERM EXPOSURES**
 - **STRENGTH OF EVIDENCE:** LIMITED
 - **IMPACTS QUANTIFIABLE?** Possibly
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL?**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (comment)**

COMMENTS:

There is some evidence on relationship between Greenspace, vegetation and wellbeing.

FORM EXETER WELLBEING 8A

- **SUBJECT: WALKING / CYCLING ENVIRONMENT and MENTAL HEALTH**
- **RESPONSIBLE AUTHOR/ORGANISATION: EXETER**
- **EXPOSURE INDICATOR: TIME SPENT WALKING AND/OR CYCLING OR AVERAGE DISTANCES/DAY/PERSON, PROXIMITY OF GREEN SPACE ,STREETLIGHTING, PRESENCE OF PAVEMENTS**
- **DATA NEEDED**
 - Depression indicators: social surveys, prescriptions for antidepressants, suicides
 - Public transport network of city
 - Cycle paths in city
 - Pavements and footpaths in city
 - Parking charges and availability of parking
 - Distance to workplace, shopping, leisure from residential areas
 - Future plans for transport mode change in city
- **LEVEL AT WHICH IT APPLIES: INDIVIDUAL**
- **HEALTH EFFECTS OF EXPOSURES (INSUFFICIENT EVIDENCE TO DIFFERENTIATE SHORT/LONG)**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? (yes)**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY (yes)**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? (yes)**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION** (people walking or cycling (active transport) and public transport users compared to those using cars.)

FORM EXETER WELLBEING 9D

- **SUBJECT: TRANSPORT MODE and EMPLOYMENT**
- **RESPONSIBLE AUTHOR/ORGANISATION: EXETER**
- **EXPOSURE INDICATOR: TRANSPORT MODE**
- **DATA NEEDED:**
 - Employment and unemployment rates
 - Proportion of workers that live in city compared to commuters
 - Public transport network of city
 - Time of day that public transport is available
 - Cycle paths in city
 - Pavements and footpaths in city
 - Safety of using cycle paths and footpaths in the dark
 - Parking charges and availability of parking
 - Distance to workplace to residential areas
 - Future plans for transport mode change in city
 - Policies requiring employers to establish travel plans for their workers
- **LEVEL AT WHICH IT APPLIES: HOUSEHOLD, EMPLOYERS**
- **HEALTH EFFECTS OF EXPOSURES (INSUFFICIENT EVIDENCE TO DIFFERENTIATE SHORT/LONG)**
 - **STRENGTH OF EVIDENCE: ADEQUATE (ish)**
 - **IMPACTS QUANTIFIABLE? (possibly)**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY (yes)**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? (no evidence)**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION** (if fuel costs become too expensive then people may have to give up their cars. The car appears to provide much more access to employment (and better employment), particularly for parents responsible for school age children and for shift work. However available evidence is patchy and tends to be in the form of percentages rather than odds ratios and tends to be found in the grey literature. However a clear effect has been established.)

FORM EXETER WELLBEING 9E

- **SUBJECT: TRANSPORT MODE and SOCIAL CAPITAL**
- **RESPONSIBLE AUTHOR/ORGANISATION: EXETER**
- **EXPOSURE INDICATOR: TRANSPORT MODE**
- **DATA NEEDED**
 - Distance to workplace, shopping, leisure from residential areas
 - Change in income available for discretionary spending by residents due to climate change policies
 - How will city attractions survive if less people travel in
 - Voluntary organisations
 - Density of pubs, clubs, voluntary organisations, churches, community centres
 - Public transport network of city
 - Time of day that public transport is available
 - Cycle paths in city
 - Pavements and footpaths in city
 - Safety of using cycle paths and footpaths in the dark
 - Parking charges and availability of parking
 - Future plans for transport mode change in city
 - Change in relative costs and affordability of different transport modes in future
- **LEVEL AT WHICH IT APPLIES: HOUSEHOLD**
- **HEALTH EFFECTS OF EXPOSURES (INSUFFICIENT EVIDENCE TO DIFFERENTIATE SHORT/LONG)**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? (possibly)**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY (yes)**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? (no evidence)**
- **WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION** (this applies to the most disadvantaged vulnerable groups – have the cities taken into account how the most vulnerable populations will travel given rises in transport costs. There is great interest in this topic but available evidence is patchy and tends to be in the form of percentages rather than odds ratios and tends to be found in the grey literature. However, there is a work currently going on in Melbourne, Australia and Oxford, UK.)

FORM EXETER WELLBEING 10D

- **SUBJECT: CLIMATE CHANGE and EMPLOYMENT**
- **RESPONSIBLE AUTHOR/ORGANISATION: EXETER**
- **EXPOSURE INDICATOR: EMPLOYMENT RATE**
- **DATA NEEDED:**
 - Employment in industries affected by policies to reduce greenhouse gas emissions for example nuclear power, fossil fuel power stations, renewable power generation, biofuels, steel industries
 - Proportion of workers that live in city compared to commuters
 - Plans to change reliance on fossil fuels in future
-
- **LEVEL AT WHICH IT APPLIES: CITY**
- **HEALTH EFFECTS OF EXPOSURES (INSUFFICIENT EVIDENCE TO DIFFERENTIATE SHORT/LONG)**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? (yes)**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY (yes)**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? (yes)**

WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION (Although mostly in the grey literature some careful work has been done on this topic – see European Trade Union Confederation (ETUC) (2007). Climate Change and Employment: Impact on Employment of Climate Change and CO2 Emission Reduction Measures in the EU-25 to 2030 Brussels. They have used % change in jobs per sector rather than odds ratios.)

FORM EXETER WELLBEING 11A

- **SUBJECT: AIR POLLUTION**
- **RESPONSIBLE AUTHOR/ORGANISATION: EXETER**
- **EXPOSURE INDICATOR:** levels of air pollutants
- **DATA NEEDED:**
 - Some ERFs have already been calculated
-
- **LEVEL AT WHICH IT APPLIES:** CITY
- **HEALTH EFFECTS OF EXPOSURES (INSUFFICIENT EVIDENCE TO DIFFERENTIATE SHORT/LONG)**
 - **STRENGTH OF EVIDENCE: ADEQUATE**
 - **IMPACTS QUANTIFIABLE? (yes)**
 - **COMPARATIVE ASSESSMENT POSSIBLE? EG ASSIGN PRIORITY (yes)**
 - **EVIDENCE OF A THRESHOLD OR “SAFE” LEVEL? (yes)**

WHAT SUB-GROUPS OF THE POPULATION ARE MOST SUSCEPTIBLE OR OTHERWISE WILL NEED SPECIAL CONSIDERATION IN QUANTIFICATION Direction of causality may be an issue – people with good mental health may be more able to avoid living in polluted areas for various reasons