Annex 22b

Adaptation

1- **Nature of the climate vulnerabilities of the program's countries and on the building sector in particular**

The climate vulnerability context is analyzed for each country in the annex of the feasibility study. For each country, the annex presents the historic climate data and the future climate projections (up to 2040, 2060 and 2100). Climate vulnerabilities are expressed for each county in terms of impact on health and/or economic.

With regards to the building sector, climate impact of climate hazards on health and productivity are detailed in the paragraph 2.2.2 of the feasibility study. This paragraph shows the need for the program to address vulnerabilities to climate change in the program's countries.

2- **Analysis of the main barriers the development of green buildings**

The chapter 3.1 of the feasibility study analyses the main barriers (technical, financial and regulatory) that are observed in those countries. Those barriers are detailed at country level in the annexes of the feasibility study.

The FP focuses on vulnerabilities related to excessively high indoor temperatures, which are projected to increase due to climate change. As described in the FP and annexes, the effects are broad and include impacts on health, the healthcare system, educational attainments, productivity at work and others. While all of these are also subject to non-climatic drivers, the FP and annexes clearly show the impact of the climatic stressors.

3- **PEEB Cool intervention and how it addresses the main barriers, thus reduces climate vulnerability**

The theory of change detailed in the funding proposal and in the chapter 3.3 of the feasibility study explains how the program's activities will eliminate the barriers that hinder the development of a resilient building sector. It demonstrates that if project stakeholders gain knowledge and experience, if investments conditions and services on the market are improved, and if clear policies and ambitious building codes are in place, then the buildings and construction sector will shift towards a low-emission and climate resilient development pathway. This will be provided by technical assistance and financing tools at subproject level to implement green building subprojects on the one hand, then institutional support to upscale good building practices at national level on the other hand.

In the absence of the programme there is a danger of maladaptation occurring. At present, in many of the countries targeted by the programme, the default response to overheating in buildings is the introduction of air conditioning as soon as this is affordable. Air conditioners are then powered by grid electricity with high emission factors, and new buildings continue to be constructed that have higher cooling loads than necessary due to designs that do not employ best practice in terms of adaptation to the (changing) local

climate. The programme will encourage adaptation instead of maladaptation. As described in more detail in Chapter 2 of the feasibility study, the programme will promote the introduction of passive measures to maintain comfortable temperatures in buildings. Where this is unavoidable, these passive measures will be supplemented by energy efficient cooling technologies and the use of renewable energy to power these technologies will be encouraged.

By improving thermal comfort in building, the program reduces direct adverse health effects, improves productivity and relieves stress from the healthcare system, therefore reducing climate vulnerability. PEEB Cool's goal to reduce vulnerability is stated at the very top of the program description in section B.3 of the funding proposal and further developed along the funding proposal and the feasibility study.

By developing bioclimatic design of buildings, at subproject level and at national level, the program enables project owners of all sectors to adopt measures that increase building's resilience against climate change, especially more frequent hot days, hot nights, and heat waves. This is quantified through thermal dynamic simulations that enables to assess to what extend the bioclimatic measures that are taken can improve thermal comfort, thus, climate resilience of buildings. This is further illustrated in the adaptation case studies developed in paragraph 5.5 of the feasibility study.

4- <u>Quantification of the beneficiaries of the program</u>

The impact assessment of the feasibility study (chapter 5.5.3) details how was determined the number of direct and indirect beneficiaries of the program.

The program's impact assessment is based on a database of subprojects that is representative of the portfolio of investments that could be attained for PEEB Cool. This database is composed of (i) subprojects already studied or supported as part of the PEEB program in the countries eligible to PEEB Cool, and (ii) subprojects in PEEB Cool's pipeline. Those subprojects represent a total investment of 1,099 M EUR. To assess PEEB Cool's adaptation impact, the impact of the database was assessed then extrapolated to reach the size of PEEB Cool's portfolio (1,287 M EUR).

Direct beneficiaries are defined as the users of buildings which construction or renovation is financed by the PEEB Cool Programme. According to the Programme targets, in buildings without mechanical cooling PEEB Cool support will lead to an increase of at least 20% in thermal comfort of users of the building, and often this number will be much higher. To assess the number of beneficiaries for PEEB Cool, the subproject portfolio that was analyzed was broken down by building type after having defined the direct beneficiaries for each building.

In the residential sector the beneficiaries were calculated based on the number of households to be built/retrofitted in each country multiplied by the members of household in each country taking into consideration the assumption that a household will reside in a house for 25 years.

Education direct beneficiaries were assessed based on an average occupancy density of 5m2/person. It is assumed that a child will remain in the same school for 5 years so for a period of 15 years the turnover ratio equals to 3.

Direct beneficiaries of the health sector were assessed based on the number of people served by health center/hospital per country. Beneficiaries correspond to the population covered and therefore are unique, even though they could use the healthcare services several times in the 15-year programme period.

Similarly to the case of education commercial use beneficiaries have been based on the default occupancy density form the EDGE app. It was further assumed that during the 15 years period 1 business will use the same space.

The number of indirect beneficiaries has been computed only for the education sector – as the impacts are only modeled for a 10 year period after the first 15 years of implementation. While additional indirect impacts could occur (especially in the residential sector), this was not estimated so as to use a conservative approach.

The total number of direct beneficiaries of the PEEB Cool Programme has been estimated at about 1.133 million people. The total number of indirect beneficiaries of the Programme is 33,620 people.