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ANNEXES

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ACRONYMS

3CSEP HEB model	Center for Climate Change and Sustainable Energy Policy High Efficiency Buildings Model
BAU	business as usual (scenario)
BID	building type identification
CCI	construction cost index
CID	climate zone identification
CPI	consumer price index
C&P	commercial and public buildings
ECS	total cumulative energy cost savings
EPBD	Energy Performance of Buildings Directive (Directive 2010/31/EU)
IDP	Integrated Design Process
INV	total cumulative additional investment costs
MF	multi-family buildings
PBID	identification of public (& commercial) buildings
RID	regional identification
SF	single family buildings
SH/C	space heating or cooling
UID	urbanization identification
VH/H/M/L HD	very high/high/moderate/low heating demand
VH/H/M/L CD	very high/high/moderate/low cooling demand
DH	dehumidification
new	new construction
anew	advanced new construction
ret	retrofit (retrofitted buildings)
aret	advanced retrofit (advanced retrofitted buildings)
N^{LOW}	compliance with only already existing local building codes is considered. Update or improvements of the existing building are not considered. The compliance with the currently building codes is assumed rather low
N^{BC}	implementation of currently valid local Building code, including ambitious EPBD implementation in the EU-27[1] and building codes for new buildings in other regions. Codes that are in the policy pipeline or upcoming are also considered (higher compliance than N^{LOW} is considered)
AN^{70+}	up to 15-30 kWh/m^2/a for SH/C
R^{10}	complex retrofit, which results in around 10% lower energy consumption as compared to a standard building
R^{30}	complex retrofit, which results in around 30% lower energy consumption as compared to a standard building - or whatever is the prevailing average retrofit
AR^{70+}	around 15-50 kWh/m^2/a for SH/C, or >70% reduction in energy consumption as compared to energy consumption before retrofit
NAM	North America, one of the eleven Word regions considered in the model

[1] DIRECTIVE 2010/31/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 May 2010 on the energy performance of buildings (recast)

WEU	Western Europe, one of the eleven Word regions considered in the model
EEU	Eastern Europe, one of the eleven Word regions considered in the model,
FSU	Former Soviet Union, one of the eleven Word regions considered in the model
LAC	Latin America, one of the eleven Word regions considered in the model
PAO	Pacific OECD, one of the eleven Word regions considered in the model
CPA	Centrally Planned Asia, one of the eleven Word regions considered in the model
PAS	Pacific Asia, one of the eleven Word regions considered in the model
SAS	South Asia, one of the eleven Word regions considered in the model
MEA	Middle East and Africa, one of the eleven Word regions considered in the model
AFR	Africa, one of the eleven Word regions considered in the model
EU-27	EU-27 includes: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden and the United Kingdom
RoW	Rest of the World, World, except for the four major regions (EU-27, USA, China and India)

EXECUTIVE SUMMARY

Several recent reports, (McDonald and Laustsen 2013, Ürge-Vorsatz et al. 2011, 2012a, 2012b, Bin and Jun 2012, Næss-Schmidt et al. 2012) have demonstrated the magnitude of energy and emission saving opportunities that can be realized through advanced and accelerated building energy efficiency retrofits and construction of highly efficient buildings. The aim of this report is to quantify the global and regional cost implications of implementing large-scale energy efficiency improvements in buildings as compared with the status-quo under certain scenarios. The scenarios considered in this study (previously defined by Ürge-Vorsatz et al. (2012b) under GBPN's initiative), focus on the deployment of very advanced (very low energy, passive or nearly zero energy) new construction and retrofits (Deep efficiency scenario), as well as more moderate improvements in building energy performance (Moderate efficiency scenario with less energy saved in retrofits and less ambitious performance levels in new construction).

As mentioned, the current study is a continuation of the GBPN's Best-practices scenario analysis (Ürge-Vorsatz et al. 2012b), and is also based on the 3CSEP HEB model (Center for Climate Change and Sustainable Energy Policy High Efficiency Buildings Model), which was extended to include the Cost analysis module (Module 2). As with the previous study (Ürge-Vorsatz et al. 2012b), this report is focused on the four key regions, including both developed regions (EU-27, USA) as well as emerging economies (China, India). The global costs and benefits for the two outlined scenarios are calculated based on the aggregation of the results for the 11 regions, defined in the Global Energy Assessment (Ürge-Vorsatz et al. 2011).

The 3CSEP HEB model is a sophisticated and complex global building energy model. It distinguishes among the buildings located in urban, rural areas or slums (where applicable), considers 3 building types (single family houses, multi-family buildings, commercial and public buildings, further subdivided into six subcategories: hotels and restaurants, educational buildings, hospitals, offices, retail buildings, and others), 5 building vintages (standard, new, retrofit, advanced new and advanced retrofit buildings), 17 climate zones and 11 world region[2] (Ürge-Vorsatz et al. 2012b) - essentially dividing the world building stock into over 10,000 unique building categories.

Due to the major challenge in accessing accurate and representative construction cost data, this study aims to show a zero order estimate of the financial costs and benefits, providing a preliminary indication of the overall cost-effectiveness of each scenario rather than presenting precise figures. The investment costs are calculated as additional to the baseline cost, which would take place if the current policy and technological trends continue without energy efficiency gains until 2050.

Similar to the scenario report (Ürge-Vorsatz et al. 2012b), the principal pillar of the modelling logic is cost-effective best-practices of building energy performance, which can be replicated for similar climatic conditions and building types. Extensive data on advanced as well as conventional buildings was collected for the four priority regions, and subsequently for other world regions. As the main focus of the study is to investigate the feasibility of a transformative pathway towards a low-energy future of the global building sector, the best-practices were searched and selected from both an energy performance and a cost perspective with a careful consideration regarding scalability. The costs associated with the implementation of the low-energy building scenario were estimated based on the current costs of developing exemplary new and retrofit buildings. The cost data from exemplary projects was included only if it was considered to be possible to upscale the best-practice across similar building types, climate zones and vintages. As consistent and reliable cost data does not exist for all regions, climate zones, building types or building vintages; costs for missing categories were assumed using a cost transfer from another similar category elsewhere in the world with better data, taking into account regional differences in the cost levels and economic conditions, based on an elaborate method (see Section 2.7 and Annex 8: Cost ratio transfer for more details).

[2] AFR, CPA, EEU, FSU, LAC, MEA, NAM, PAO, PAS, SAS, WEU (for the regional split see Annex 4).

The results of the cost analysis show that for all four major regions (EU-27, USA, China and India), as well as for the world as a whole, the total cumulative energy cost savings under the Deep efficiency scenario exceed the total cumulative additional investment costs (see Table 1 and Figure 1).

Table 1: Total cumulative additional investment costs vs. total cumulative energy cost savings until 2050

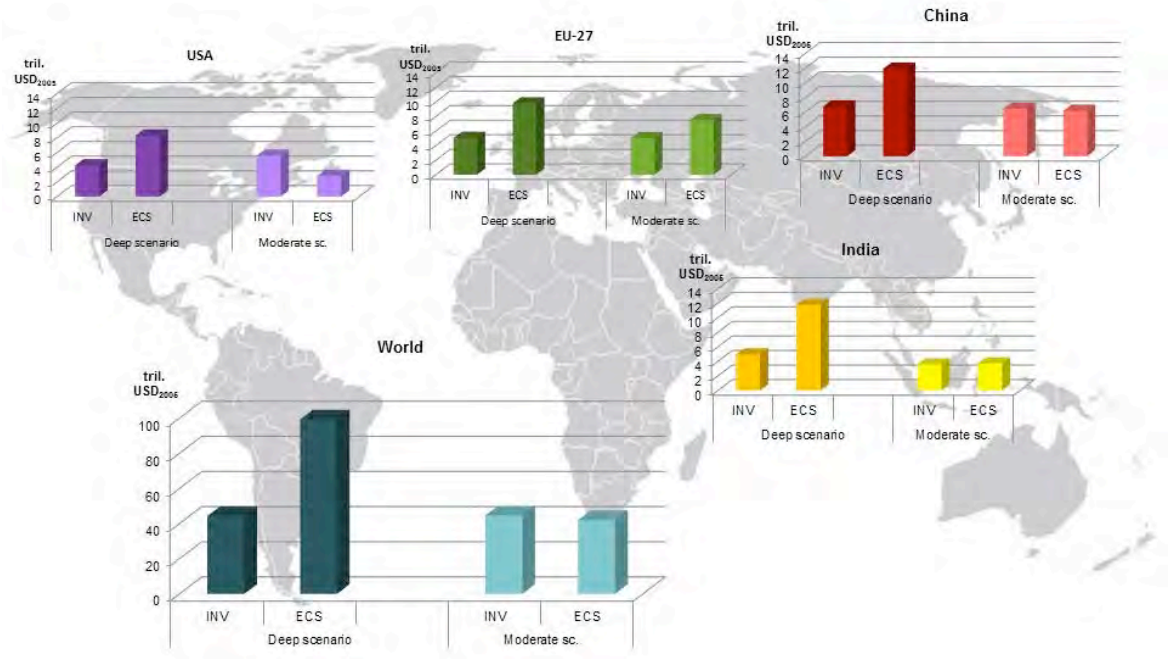
Region	Deep efficiency scenario		Moderate efficiency scenario	
	Total cumulative additional investment costs	Total cumulative energy cost savings	Total cumulative additional investment costs	Total cumulative energy cost savings
	tril. USD_{2005}	tril. USD_{2005}	tril. USD_{2005}	tril. USD_{2005}
EU-27	5.1	9.8	5.0	7.5
USA	4.3	8.3	5.6	2.8
China	6.8	11.9	6.5	6.2
India	5.0	11.8	3.6	3.7
RoW[1]	23.3	42.2	24.00	14.8
World[2]	44.3	99.2	44.6	42.0

Notes: 1 - RoW - Rest of the World; 2 – Note, that the region World is not a simple sum of the four major regions and RoW region, but rather a sum of the 11 world regions. Therefore there are differences in World and sum of the four major regions.

On the other hand, under the Moderate efficiency scenario, for most of the regions (except for EU-27), the total cumulative additional investment costs exceed the total cumulative energy cost savings achieved through such investment. In the EU-27 this is mainly due to rather ambitious assumptions (due to EPBD recast implementation) for the Moderate scenario. Much lower cost-effectiveness (i.e. the difference between energy cost savings and additional investment costs) is achieved under the Moderate efficiency scenario as compared to the Deep efficiency scenario in all regions. In some regions, the cumulative additional investment costs are even higher in the Moderate scenario than in the Deep scenario (World, RoW and the USA). The main reason for this is that the rate of the highly energy efficient buildings – advanced new and advanced retrofit - is fluctuating differently in the different scenarios in the floor area projections. Namely, the share of advanced buildings is significantly higher in the Deep scenario than in the Moderate scenario. The other relevant variable of the calculation is the specific investment costs calculated yearly due to technological learning. Due to the dynamics of these changes, as a result, the cumulative additional investment costs of Moderate scenario exceed that of the Deep scenario for example in case of the USA by 2032. Thus, regarding the period to 2050, the implementation of the Moderate scenario would cause even higher investments in the specific region of the USA as it is shown in the report in detail.

The Moderate efficiency scenario is cost-effective only in EU-27 and India (under the given assumptions). While in EU-27 all building types are cost effective, in India it is only two of them. EU-27 is the only major region where many countries have adopted nearly zero energy targets for new buildings and significant energy savings are mandated in major retrofits. In light of this there is less difference between the Deep and Moderate scenario in this region relative to other world regions. The cost effective potential of the Moderate scenario in India is mainly due to its low specific investment costs in general. Nevertheless, the difference between the total cumulative additional investment costs and the total cumulative energy cost savings is very small.

Figure 1: Total cumulative additional investment costs vs. total cumulative energy cost savings until 2050 under the Deep efficiency and Moderate efficiency scenario



Note: INV – total cumulative additional investment costs; ECS - total cumulative energy cost savings

In the rest of the world region (World except for the for the four major regions – EU27, USA, China India) the Deep efficiency scenario is cost-effective, unlike the Moderate efficiency scenario. Similarly, the Deep efficiency scenario is cost-effective for World in total, while the Moderate efficiency scenario is not.

In summary, the results show that in the long term, unlike the Moderate efficiency scenario, the Deep efficiency scenario is cost-effective for all four major regions, as well as for the World. The results also show that for all analyzed regions and the world the Deep efficiency scenario has higher energy cost savings and higher cost-effectiveness (i.e. the larger difference between energy cost savings and investment costs) than the Moderate efficiency scenario.

When we compare these findings with other relevant studies (BPIE 2011), GEA - in Ürge-Vorsatz et al. 2011, McKinsey - 2007, 2009a, 2009b) on cost analysis of low energy transition in the building sector, the results of the cost analysis of the 3CSEP HEB Model are in most cases at the same level of magnitude (GEA, in Ürge-Vorsatz et al. 2011 – e. g. for instance total cumulative energy cost savings in the EU, USA, China), yet there are some differences. For example, the total cumulative additional investment costs calculated in the current study are several times higher than the results of other relevant studies (e.g. Global Energy Assessment - GEA described in Ürge-Vorsatz et al. 2011 and BPIE 2011). This difference in total investment needs is mainly due to much more conservative specific investment costs used for the 3CSEP HEB Model, in a meaning of significantly more thorough and detailed data collection and much more expert reviews where data were not available, which resulted in using higher additional investment costs than in other relevant studies (e.g. in BPIE 2011). However, after careful considerations and careful checks, the authors agreed to use the figures documented in this report despite this discrepancy because the current study is based on a thorough data collection for different climate zones, regions and building types and vintages and cautious cost transfer, combined with a profound multiple-expert review. These efforts constitute the major value added of this study. However, the current study has come to the conclusion, which is in line with the GEA, that further data collection and verification is still necessary in India and other developing regions. Moreover, further data collection would be beneficial for those regions that depend on cost transfer (China and partially also some building vintages in the USA).

A thorough sensitivity analysis was conducted in order to show how different variables influence the overall results of the cost analysis, and which variables have a significant impact on the cost-effectiveness of the two scenarios. The results show that the variables in general do not significantly influence the cost-effectiveness of the two scenarios at the global scale. However, due to changes in certain variables the Deep scenario may no longer be cost-effective for some regions, e.g. when energy prices fall significantly (hypothetically, if energy prices fall by 70% as compared to the default projections, the Deep scenario would not be cost-effective for EU-27, China, USA and World anymore), or when the specific investment costs do not decrease enough, i.e. when the learning factor is not high enough (when specific investment costs of advanced buildings decrease only by 15% by 2050 as compared to their 2005 value as opposed to the default learning factor of 50%, the Deep efficiency scenario would not be cost-effective for the USA). The cost-effectiveness of the Deep scenario does not change for any region even if the specific investment costs increase (both costs of advanced buildings and costs of conventional buildings) by up to 50%. An increase in specific energy consumption does not have a significant influence on the results, as change in this variable is only applied to advanced buildings. A change in specific energy consumption triggers the most significant impact in China and India, where a large number of advanced buildings is expected by 2050.

On the other hand, the results show that cost-effectiveness can be reached under certain circumstances even under the Moderate efficiency scenario in some regions - for example this scenario can become cost-effective in China, India and the World in case energy prices increase by at least 30% by 2050 of their currently projected level. Similarly, this scenario may become cost effective in China and the World region when specific investment costs decrease by at least 25% and in the USA with the decrease of at least 50% of the specific investment costs.

Based on the sensitivity analysis, we can summarize that the variables with the most significant impact on the results and overall cost-effectiveness of the scenarios are energy prices and the learning factor. Thus, these are important variables that need to be taken into account when interpreting the results of the current study. These also point to important policy implications: if a low-energy building future becomes an important policy goal (such as for climate, energy security, improved social welfare or other reasons), its economic efficiency can be best promoted by catalyzing fast and effective technology learning (such as through demonstration projects, well-targeted and designed investment subsidy schemes, etc.), as well as eliminating the distortion of energy prices by subsidies.

Recommendations

The results of the study show that from the long-term perspective, the "deep" path is much more cost-effective from a societal perspective than the "moderate" scenario. More concretely, it is economically much more efficient to promote the proliferation of very high performance buildings rather than to focus on accelerated investment into “shallow” energy efficiency improvements during the building retrofit or construction. This is valid both for developed countries, where the main construction activity focuses on retrofit of existing buildings, and for emerging economies and developing countries, where significant volumes of new buildings are added every year. Thus, ambitious building codes for new construction and their strong enforcement are necessary in developing and emerging regions. As in China both new and retrofit are expected to be dominant vintages in terms of their share in the Chinese 2050 building stock (see page 55, technical report, Ürge-Vorsatz et al. 2012b), in the long term, well-designed building codes are recommended to cover also retrofit buildings and be strictly enforced.

The study proves that long-term cost analysis of building use scenarios, despite all its uncertainties, is crucial in order to have a comprehensive overview of the financial costs and benefits of alternative pathways in the building sector. The reason is that buildings are structures with a long lifetime, and the full benefit of advanced measures can only be seen after several decades of the building's operation. In addition, it is particularly important to view long-term impacts/benefits in the case of a know-how, such as very highly efficient buildings, because their real economic benefits appear after the learning period. Most of the major regions reach cost-effectiveness between 2030-2040, i.e. beyond the 2030 horizon, which is often used for analysis of energy savings potential in buildings.

In order to avoid the risk of the “lock-in effect” of the energy saving, governments are advised to first develop strategies to increase the minimum requirements of new construction and retrofit towards high energy performance levels. Only then is it

recommended to introduce financial mechanisms or policies to accelerate retrofit rates (where applicable) supporting the deployment of advanced buildings on a large scale. This recommendation is very important as financial mechanisms with low energy savings requirements usually lead to the acceleration of "shallow" retrofits with low levels of energy savings (e.g. at the level of Moderate efficiency scenario). Such mechanisms, without a long-term framework strategy and progressive improvement of energy performance requirements as a condition for provision of the financial support, will inevitably lead to a significant "lock-in effect", when a significant portion of potential building's energy savings, and, thus, related emissions reductions, are locked-in for several decades until the next round of renovation becomes economically feasible.[3]

Another important factor crucial for the realization of the full energy efficiency potential, that long-term strategy and ambitious minimum requirements may bring, is education and training. The extent and rate of deployment of advanced buildings depend both on the availability of the high efficiency building elements and the preparedness of the construction industry. Therefore, it is recommended that governments ensure that all construction professionals involved in the construction process of advanced buildings (e.g. architects, planners, engineers, equipment installers, craftsmen, building inspectors, energy auditors, and site managers) have necessary education and training so that advanced buildings can be deployed at a large scale.

[3] The renovation cycle usually lasts between 30-40 years in OECD countries according to Laustsen (2008), but can be longer in countries with a long period of building stock depreciation (Csoknyai 2009 in Korytarova 2010).

ANNEX 1: FORMAL EQUATIONS FOR COST ANALYSIS

As mentioned in Chapter 2: Methodology and assumptions, the two main deliverables of the study are total cumulative additional investment costs and the total cumulative energy cost savings.

1. Total cumulative additional investment costs

The cumulative additional investment costs are calculated according to Equation 1.1 – Equation 1.5 for all building vintages (new, ret, anew, aret) and for the two scenarios (Deep, Moderate):

- **Additional investment costs**

$$AIC_{i,k,m,o,p\_new} = FIC_{i,k,m,o,p\_new} - BC_{i,k,m,o,\_Frozen\_new} \quad \text{Equation 1.1}$$

$$AIC_{i,k,m,o,p\_anew} = FIC_{i,k,m,o,p\_anew} \cdot TL_{i,\_anew} - BC_{i,k,m,o,\_Frozen\_new} \quad \text{Equation 1.2}$$

$$AIC_{i,k,m,o,p\_ret} = FIC_{i,k,m,o,p\_ret} - BC_{i,k,m,o,\_Frozen\_ret} \quad \text{Equation 1.3}$$

$$AIC_{i,k,m,o,p\_aret} = FIC_{i,k,m,o,p\_aret} \cdot TL_{i,\_aret} - BC_{i,k,m,o,Frozen\_ret} \quad \text{Equation 1.4}$$

- **Total cumulative additional investment costs**

$$TCAIC_{i,k,l,m,o,p} = \sum_{(i=1 \rightarrow n)} [(FA_{i,k,l,m,o,p} - A_{i-1,k,l,m,o,p}) \cdot AIC_{i,k,l,m,o,p}] \quad \text{Equation 1.5}$$

for n=46 (2005-2050)

Where:

$AIC_{i,k,l,m,o,p}$ – additional investment costs per unit of floor area in building type *k*, in building vintage *l* (new, ret, anew, aret), in climate zone *m*, in region *o*, in scenario *p* in year *i* [$\$_{2005}/m^2$]

$FIC_{i,k,l,m,o,p}$ – full specific investment cost per unit of floor area per building type *k*, per building vintage *l* (new, ret, anew, aret), per climate zone *m*, per region *o*, per scenario *p* in year *i* [$\$_{2005}/m^2$]

$BC_{i,k,l,m,o,Frozen}$ – full baseline specific investment cost per unit of floor area per building type *k*, per building vintage *l* (new, ret), per climate zone *m*, per region *o* under the Frozen efficiency scenario in year *i* [$\$_{2005}/m^2$]**

$TL_{i\_anew/aret}$- technology learning factor of the investment costs per unit of floor area in year *i* for advanced new or advanced retrofit [%]

$FA_{i/(i-1),k,l,m,o,p}$– annual floor area per building type *k*, per building vintage *l*, per climate zone *m*, per region *o*, per scenario *p* in year *i* (actual year) or year *i-1* (previous year) [m^2]

$TCAIC_{k,l,m,o,p}$– total cumulative additional investment costs per building type *k*, per building vintage *l*, per climate zone *m*, per region *o*, per scenario *p* [$\$_{2005}$]

Frozen – parameters for Frozen efficiency scenario

p – scenario other than Frozen efficiency scenario (i.e. Moderate efficiency scenario, Deep efficiency scenario)

** *Note*: Baseline costs mean the costs of the conventional buildings in Frozen scenario (ret, new) corresponding to the vintages in Deep/Moderate scenarios (new, ret, anew, aret) according to the following table:

Table 39: Corresponding vintages under the mitigation and baseline scenarios

Building vintages in Deep/Moderate efficiency scenario	Corresponding vintages in Frozen efficiency scenario
new = N^{BC}	new = N^{LOW}
ret = R^{30}	ret = R^{10}
anew = AN^{70+}	new = N^{LOW}
aret = AR^{70+}	ret = R^{10}

2. Total cumulative energy cost savings

The total cumulative energy cost savings are calculated based on Equation 1.6 – 1.10:

- **Energy savings (for new buildings and for retrofitted buildings)**

$$ES_{i,k,m,o,p\_new} = EC_{i,k,m,o,Frozen\_new} - [\, EC_{i,k,m,o,p\_new} + EC_{i,k,m,o,p\_anew} \,] \quad \text{Equation 1.6}$$

$$ES_{i,k,m,o,p\_retrofitted} = [EC_{i,k,m,o,Frozen\_standard} + EC_{i,k,m,o,Frozen\_ret}] - [EC_{i,k,m,o,p\_standard} + EC_{i,k,m,o,p\_ret} + EC_{i,k,m,o,p\_aret}] \quad \text{Equation 1.7}$$

- **Total cumulative energy cost savings**

$$ECS_{i,k,m,o,p\_new} = \sum_{(i=1\rightarrow n)} (ES_{i,k,m,o,p\_new}) \cdot EP_{i,o,r}) \quad \text{Equation 1.8}$$

$$ECS_{i,k,m,o,p\_retrofitted} = \sum_{(i=1\rightarrow n)} (ES_{i,k,m,o,p\_retrofitted} \cdot EP_{i,o,r}) \quad \text{Equation 1.9}$$

$$ECS_{i,k,m,o,p\_tot} = \sum_{(i=1\rightarrow n)} (ECS_{i,k,m,o,p\_new} + ECS_{i,k,m,o,p\_retrofitted}) \quad \text{Equation 1.10}$$

for n=46

Where:

$ECS_{i,\,k,\,m,\,o,\,p\_new/retrofitted/tot}$ - total cumulative energy cost savings per building type *k*, per climate zone *m*, per region *o*, per scenario *p* and in year *i* [EJ] for new buildings or for retrofitted buildings or for total building stock

$EC_{i,k,m,o,p/Frozen\_vintage}$ – energy consumption per building type *k*, per climate zone *m*, per region *o*, per scenario *p/Frozen* and in year *i* per given vintage (standard, new, ret, anew, aret)

$ES_{i,\,k,\,m,\,o,\,p\_new/retrofitted}$ - energy savings per building type *k*, per building vintage *l*, per climate zone *m*, per region *o*, per scenario *p* and in year *i* [EJ/year] for new buildings or for retrofitted buildings

$EP_{i,o,\,r}$ – energy prices in year *i*, in region *o* and for fuel *r* [$\$_{2005}$/kWh]

Both indicators - additional investment costs and energy cost savings are calculated cumulatively from the base year 2005 up to year 2050, for all building types (except for slums), for all building vintages (except for standard, where there is no cost), all regions and all considered CIDs for the given region. Standard is considered only in calculation of energy savings.

ANNEX 2: ASSUMPTIONS FOR THE COST ANALYSIS BY REGION

A2.1. The European Union-27

A2.1.1 Assumptions for cost identification

The main cost identification assumptions are the following:

- The priority of genuine region-based data applies over cost transfer.
- From the collected cases, the cases of advanced buildings with the lowest investment costs per unit of floor area (USD_{2005}/m^2) are selected.
- During the cost identification, the following assumptions were maintained:
    - Additional investment costs in AN^{70+} are higher than in N^{BC} and higher than in N^{LOW}
    - Additional investment costs in AR^{70+} are higher than in AN^{70+}
    - Additional investment costs in R^{30} are higher than in R^{10}
- Each cost input is considered case-by-case, all very low costs are examined. If the cost of an advanced building construction is unreasonably low (e.g. if the costs are approximately 30% lower (or more) than the average specific investment costs for comparable building type and vintage), it is not used as an input data in the input table. The averages of no more than five lowest costing cases become an input for the model calculation (however, in several/majority? of cases the number of reliable case studies was lower than that).
- Nevertheless, there are exceptional cases of best-practices, where AR^{70+} happens to be cheaper than AN^{70+}, or AN^{70+} is cheaper than N^{BC} and N^{LOW}.

A2.1.2 Assumptions for cost transfer

For regions where no cost data was found (or cases with insufficient energy consumption data), cost transfer is applied with the following assumptions:

- For the EU-27, due to its long tradition of passive house design, construction and retrofit, the genuine cost data from the European countries is preferred. No cost data is transferred from other (non-European) regions.
- However, for the CIDs within EU-27 for which cost data is not available (e.g. SF retrofit), cost data is transferred (i.e. estimated based on) from another CID (CIDs are represented by different member states in the EU-27).
- For the unavailable cost data for advanced buildings, the costs of other CIDs were used (within EU-27) with the application of a ratio of costs of advanced new construction (N^{70+}) to cost of new construction (N^{BC}) or a ratio of cost of advanced retrofit (AR^{70+}) to cost of retrofit (R^{30}).
- Due to lack of reliable data for the baseline retrofit (R^{10}) and conventional retrofit (R^{30}) the costs of these are estimated as a certain share of the specific investment cost for advanced retrofit (AR^{70+}). The cost of R^{10} is assumed to be 60% of the cost of AR^{70+} and the cost of R^{30} is estimated as 80% of the cost of AR^{70+}. These ratios are based on expert estimates of the current price level of conventional retrofit (Reith 2013, ETK 2008-2011).
- For CID 2, it is assumed that the cost for the building in N^{LOW} category is equal to the cost N^{BC} ones due to the fact that the compliance in CID 2 (Scandinavian countries such as Sweden, Finland, and Denmark) with the current building code is very high (Laustsen, 2008).
- For C&P, where no cost data is available for CID 6, data is transferred from CID 8, based on similar climatic characteristics (high heating demand with low cooling demand and medium heating demand and low cooling demand – for more information see Table 7).
- In cost transfer only the ratios of conventional to advanced cost are transferred. This means, first, at least one of the two vintages (conventional or advanced) must be established. Then, the ratio of conventional and advanced cost (in the corresponding vintage) can be applied.

A2.2.3 Assumptions for the minor climate zones

As mentioned above, the major CIDs in EU-27 are CID 2, CID 6 and CID 8. These CIDs were the primary target in data collection, however, there are also several cases from the CID 1, 3, 9, 10, 12, 15, 16, 17 (sometimes only conventional new buildings are available). The following main principles are used in the process of cost transfer in the minor climate zones:

- The known cost ratios for the specific vintage categories are guidance for the assumption of an unknown[28]
- Also the similarity of the climatic characteristics, such as:
  - CID 1 is similar to CID 2
  - CID 9 and CID 10 are similar to CID 8
  - Also CID 12, 15, 16 and 17 are similar due to the dominance of the cooling demand[29]
- For the minor climate zones, the rates of the costs were transferred between similar climatic zones in order to ensure a proportional approach.

Due to the small share of the minor zones, the estimates and assumptions described above are not expected to have significant influence on the final results of the region.

The resulting specific investment costs (USD_{2005}/m^2) after cost identification and cost transfer for all EU-27's CIDs, building types and vintages can be found in Table 42, Table 43 and Table 44 in Annex 4.

A2.2 The United States of America

This subsection includes major region-specific assumptions used for cost analysis including cost identification for both major and minor climate zones as well as cost transfer assumptions.

A2.2.1 Assumptions for cost identification

Although there are several examples of best-practices in the USA, these are not available in all major CIDs and building types. Significant data gaps have been revealed for advanced retrofit for single-family and multifamily buildings. Moreover, it was not possible to find the data for conventional retrofit buildings (except for C&P, where data for R^{30} was accessed) as well as data for buildings in the N^{LOW} category. The lack of the data for conventional retrofit buildings might be explained by the fact that in the USA it is more economical to buy/build a new house than to perfrom renovation, although this might change after the mortgage bubble collapsed in the country. Cost data for advanced retrofit buildings was not available for most of the building types (except for C&P, where it is available for 2 major CIDs).

A2.2.2 Assumptions for cost transfer

Due to the lack of cost data for certain categories, the data gaps for the USA have to be filled through the estimations based on the cost transfer from the EU-27. For this purpose the following assumptions have been made:

- The costs for the baseline retrofit (R^{10}) and conventional retrofit (R^{30}) are estimated as a certain share of the specific investment cost for advanced retrofit (AR^{70+}). The costs of R^{10} buildings are assumed to be 60% of the costs of AR^{70+} building vintage and the costs of R^{30} category are estimated as 80% of those for AR^{70+}. These ratios are based on expert estimates of the current price level of conventional retrofit (Reith 2013, ETK 2011).
- Cost ratios transfer is applied to estimate cost values for conventional new buildings (only N^{LOW}) for CID 6. Costs of these buildings are based on the data in the EU-27 with the applications of certain costs ratios for the USA.
- Subsequently, the estimated costs of conventional buildings in CID 6 have served as a basis for cost estimations in other US CIDs by using the US construction cost index (CCI) (ENR 2012).
- Several cost data points for advanced new and advanced retrofit are calculated based on the EU-27 data and through utilisation of conventional-to-advanced costs ratio [30].

[28] See Annex 7: Cost ratio transfer

[29] In EU27, CID 17 is occurs in the Mediterranian countries, where cooling demand is the dominant instead of heating, please see climate identification.

A2.2.3 Cost assumptions for the minor climate zones

The case studies are available mainly for the major climate zones, except for CID 2. Thus, in CID 2 the ratio of the known costs is used for estimating the values for the data gaps in other minor CIDs. Therefore the costs for these zones are calculated based on the costs of the most relevant climate zone to the climate zone in question:

Costs of CID 1 and CID 4 are calculated based on the costs in CID 2, as all these zones are characterised by high heating demand, combined with low cooling demand in the case of CID 4

CID 8 has similar climatic conditions as CID 9 (CID 8: medium heating demand + low cooling demand, CID 9: low heating demand + medium cooling demand), thus for CID 8 the specific investment costs of CID 9 have been used.

CID 7 (medium heating demand and medium cooling demand) is considered to have similarities with major zone CID 6 (high heating demand and low cooling demand) and CID 9 (low heating demand and medium cooling demand),and thus the costs in CID 7 are calculated as an average of the costs in CID 6 and CID 9

CID 10 (low heating demand and low cooling demand) is a bit milder than CID 9 (low heating demand and medium cooling demand), and thus the costs of CID 10 are assumed to be equal to or lower than the costs of CID 9, and therefore, the same costs as in CID 9 are applied

Similarly, CID 12 (only high cooling demand) is milder than CID 15 (high cooling demand + dehumidification) thus for CID 12 the costs of CID 15 have been used.

Although these assumptions can provide only approximate estimations, the shares of most of the CIDs, for which the assumptions have to be made, are rather small in the total population of the region and thus do not have a significant influence on the results.

The resulting specific investment costs (USD_{2005}/m^2) after cost identification and cost transfer for all CIDs, building types and vintages in the USA can be found in Table 45, Table 46 and Table 47 in Annex 4).

A2.3 China

This subsection includes major region-specific assumptions used for cost analysis including cost identification for both major and minor climate zones as well as cost transfer assumptions.

A2.3.1 Assumptions for cost identification

The data collection focused on three major CIDs for China (CID 6, CID 15 and CID 17). Although there are some examples of best-practices in China, they are not sufficient for a cost analysis for the whole region. Due to the lack of genuine data, cost data was transferred from Europe and the USA. From the collected cases, the cases of advanced buildings with the lowest investment cost per unit of floor area (USD_{2005}/m^2) are selected.

A2.3.2 Assumptions for cost transfer

The following cost transfer assumptions are applied to fill the data gaps for China:

- One of the main starting points for the cost transfer were the costs for conventional new construction (based on Turner& Townsend, 2012) and few reliable case studies of advanced buildings both new and retrofit available in the region.
- The first priority was given to transfer from the same region (however, it was not possible in a number of the cases), followed by the transfer from another region, but for the same climate zone. The following principles were applied: the additional costs of advanced new buildings are higher than of those, which comply with the local building codes.

[30]One type of ratio transfer among others, where the ratio of specific investment cost of advanced new buildings to the baseline buildings' is assumed equal within similar climatic conditions and within the same region. See Annex 7: Cost ratio transfer

At the same time the costs of the latter ones are higher than those of the new buildings with lower compliance with the exisiting local building codes. For retrofit buildings the costs of "deeper" retrofit are higher than those of the buildings, which can achive not more than 10% of energy savings (AN^{70+}>N^{BC}>N^{LOW}, AR^{70+}> AN^{70+} and R^{30}>R^{10}).

- CID 6: as the CID 6 is represented both in the EU-27 and the USA, averages of the costs in these two regions were transferred to China. The cost values for missing data in a certain building category are transferred by applying a ratio between the costs of conventional new buildings in China to the ones in the USA (this ratio has been multiplied by a cost value transferred from either the EU-27 or USA input table for a given building type and vintage).
- For CID15 and CID 17 the same methodology is applied as for CID 6, however, only the USA cost ratio was used due to the fact that these CIDs are not significant climate zones in the EU-27.
- In some cases (for some C&P advanced new buildings) cost data is known from the same region but different climate zones, and, thus, the ratio of costs of advanced building and costs of the conventional building is used for the cost transfer within the region, where the data is known.
- In order to calculate the cost of advanced retrofit in China the ratio between the costs of advanced retrofit and the ones of advanced new buildings in a zone with similar heating or cooling demand has been applied (this ratio is applied to the cost of advanced new building in China for the given climate zone).
- Due to lack of reliable data for the baseline retrofit (R^{10}) and conventional retrofit (R^{30}) the corresponding costs are estimated as a certain share of the specific investment cost for advanced retrofit (AR^{70+}). The costs of R^{10} buildings are assumed to be 60% of the costs of AR^{70+} buildings and the cost of R^{30} buildings are estimated as 80% of the cost of AR^{70+} ones. These ratios are based on expert estimates of the current price level of conventional retrofit (Reith 2013).
- The costs for the rest of the climate zones (minor climate zones) are calculated based on the cost transfer across regions and climate zones (see next subsection).

A2.3.3 Assumptions for the minor climate zones

Among minor zones several case studies were available for CID 4. The following assumptions are made for cost identification and cost transfer in the minor climate zones:

CID 1 and CID 2 are assumed to be similar to CID 4 and major CID 6 in terms of investment costs data: since CID4 has 6% share of the population and CID6 has 11% while the population of CID1 and CID2 are below 3% - and reliable cost data were available for CID4 and CID6 but not for CID1 and CID2 - the assumption, that these climate zones have the same investment cost, has been applied.

CID 3 is milder than the CID 4 and CID 6 in terms of heating demand, therefore the costs in this climate zone are assumed to be 10 percent lower due to lower costs of equipment and energy efficiency measures[31] (the share of the CID 3 accounts for only 0.2% of the region's population).

Similar logic is applied to CID 5, the costs in which are assumed to be 10 percent higher than the costs of CID 6 due to the higher cooling demand, but comparable heating demand (the share of CID 5 is below 0.5% of the total region's population).

The cost data for CID 7 and CID 8 are estimated to be similar to major CID 6 (CID 7 accounts for 0.2% and CID 8 for 4.5% of the total region's population).

CID 9 and CID 10 are assumed to be 10% cheaper than CID 7 due to the milder climatic conditions (CID 9 and CID 10 account only for less than 1% and 2% of the total region's population, respectively).

CID 12 and 14 are assumed to be similar to CID 15 (high cooling and dehumidification, both CIDs account for less than 1 % on the total region's population).

CID 13 is assumed to be similar to CID 9, due to the medium cooling demand (CID 13 accounts for less than 1% of the total region's population).

Although these assumptions might be considered rough, it has to be notd that the share of the most CIDs, in which data is unavailable, is rather small in the total population of the region and, thus, is unlikely to cause significant discrepancy.

[31] Milder climate requires less insulations, doors and windows with less stringent insulation value, also less heating/cooling equipment, or equipment with less power (Reith, 2014)

The resulting specific investment costs (USD_{2005}/m^2) after cost identification and cost transfer for all CIDs, building types and vintages in China can be found in Table 48, Table 49 and Table 50 in Annex 4.

A2.4 India

This subsection includes major region-specific assumptions used for cost analysis including cost identification for both major and minor climate zones as well as cost transfer assumptions.

A2.4.1 Assumptions for cost identification

The data collection focused on two India's major climate zones (CID 14 and CID 15). Some examples of best-practices in India, have been found, however, these were not sufficient to base the cost analysis for the whole region on. Most of the available case studies belong to C&P building type. However, the construction costs of the available case studies show a large deviation, thus, the reliability of each case was examined thoroughly. Main data gaps concern advanced residential buildings (SF, MF). From the collected data, the cases of advanced buildings with the lowest investment costs per unit of floor area (USD_{2005}/m^2) have been selected and their average has been used as the final input data for the cost calculation.

A2.4.2 Assumptions for cost transfer

Due to the lack of genuine data in India, cost data have been estimated using reliable data from Europe and the USA and applying a well-elaborated methodology for cost transfer. The following data transfer assumptions have been applied in order to fill in identified data gaps:

- One of the main starting points for the cost transfer are the costs of conventional new construction (Turner & Townsend, 2012) and the few reliable case studies of advanced buildings, which are available for both types of advanced vintages (new and retrofit).
- The same methodology as in the USA, EU-27 and China has been utilised for the estimations in India, i.e. the first priority has been given to cost transfer within the region (however, this was not possible in most of the cases in India), followed by the priority of transfer in the same climate zone, by the following logics:
    - Additional investment costs in AN^{70+} are higher than in N^{BC} and higher than in N^{LOW}
    - Additional investment costs in AR^{70+} are higher than in AN^{70+}
    - Additional investment costs in R^{30} are higher than in R^{10}
- In the case of CID 15 the costs are transferred from the USA through the application of the ratios of the costs for conventional buildings between the USA and India (the same methodology as in China).
- In some cases (some C&P advanced new buildings) cost data were known from the same region but different climate zones than the major CIDs, and, thus, the advanced-to-conventional building cost rate has been used for the cost transfer.
- As CID 14 and CID 15 have similar climatic conditions (very HCD +DH, HCD +DH), the costs of CID 15 (transferred from the USA) have been transferred within India between building types through the ratio of the known costs in India and the USA.
- Due to lack of reliable data for the baseline retrofit (R^{10}) and conventional retrofit (R^{30}) the costs for these vintages are estimated as a certain share of the specific investment cost for advanced retrofit (AR^{70+}). The costs of R^{10} buildings are assumed to be 60% of the cost of AR^{70+} ones and the costs of R^{30} buildings - 80% of AR^{70+} buildings' costs. These ratios are based on expert estimates of the current price level of conventional retrofit (Reith 2013).
- The costs for the less relevant climate zones were calculated with more rough estimations, which are described in the next section.

A2.4.3 Assumptions in the minor climate zones

The major climate zones in India are CID 14 and CID 15. For other climate zones the following assumptions have been applied:

- For the CIDs 1, 2, 3, 8, 9, 10 – because of the large difference in the climatic conditions as compared to the CID 14 and CID 15 the cost rate of the known cases from India and China were used to calculate an estimate based on the cold climate zones of China.
- CID 11 is assumed to have the same costs as CID 14 (as in both zones there is very high cooling demand).
- For CID 12 and CID 13 a cost transfer from China (CID 12 and CID 13) has been applied.
- The costs in CID 16 are assumed to be 10 percent lower than those in CID 15 (as CID 15 has high cooling demand and dehumidification and CID 16 is characterized by low/medium cooling and dehumidification).

Although these assumptions result only in very approximate estimations, it has to be pointed out that the shares of these CIDs are rather small in the total population of the region and, thus, are unikely to lead to significant discrepancies in the overall results.

The resulting specific investment costs (USD_{2005}/m^2) after cost identification and cost transfer for all CIDs, building types and vintages in India can be found in Table 51, Table 52 and Table 53 in Annex 4.

A2.5 The Rest Of The World

This subsection includes major region-specific assumptions used for cost analysis including cost identification for both major and minor climate zones as well as cost transfer assumptions.

A2.5.1 Assumptions of cost identification

The following main assumptions were used in the cost identification for the 11 world regions:

- In the regions of EEU, WEU, NAM, CPA and SAS the specific investment costs of the regions EU-27, USA, China and India were used as a basis.
- In the rest of the regions the specific costs were transferred from the 4 major regions.

A2.5.2 Assumptions of cost transfer

In the 3CSEP HEB model the World is split into 11 regions (see Annex 5: Regional split). For each region the same methodology has been used as in the case of the four main regions. Data collection for the World's construction costs of the advanced buildings and the cost of conventional construction focused on the major climate zones. Similarly to the four main regions data gaps were filled with transferred values from the regions with available and reliable cost data. The main criteria for the data transfer were the following:

- The first priority was given to cost transfer from the same region (this was not possible in most of the regions except for EEU, WEU, CPA, NAM and SAS), followed by the priority of the same climate zone, by the following logics:
    - Additional investment costs for AN^{70+} are higher than for N^{BC} and higher than for N^{LOW}
    - Additional investment costs for AR^{70+} are higher than for AN^{70+}
    - Additional investment costs for R^{30} are higher than for R^{10}, additional investment costs for R^{30} are approximately the same as for AR^{70+}
- In order to estimate the construction costs for unavailable data points the transfer of the known cost data was used
- These calculations were applied in the major climate zones for each region
- In some cases the approach described above could not have been used, so the following rough assumptions were applied:
- In case of the LAC region where there are no single family case studies available, the costs for this building type are calculated based on the ratio of newly built multifamily and single family construction cost in the USA.
- For climate zones, which have small share in the region's population and similar climatic conditions (such as very high heating demand - CID 1 and high heating demand - CID 2), the same specific investment costs are assumed.

- In other cases similar to the previous one the costs of a more severe climate zone were applied. In the zones with high cooling demand and very high cooling demand the same investment costs are considered. These assumtions are applied only to those climate zones, where the share of the specific climate zone in the region's population is below 5%.
- For the region of NAM the US cost data is applied except for CID 14, which is not a major climate zone in the USA, but it is relevant in the region NAM.
- In the case of NAM due to the small population share of CID 14 and the similarity to climatic conditions of the zone 15 (very high cooling demand with dehumidification and high cooling demand with dehumidification) the costs for CID 14 are assumed the same as in CID 15.
- In the case of SAS the costs of the India's major climate zones are applied. For the climate zones (which are not present in India but they are in SAS) the costs are estimated based on the climatic similarities and the ratio of the costs in the different climate zones: CID 6, CID 7, CID 17 – the ratio of the CID 6 and CID 15 and the ratio of CID 17 and CID 15 have been transferred from China, while the costs of the CID 7 are assumed to be the same as the costs for CID 6 due to common characteristics of the two CIDs (CID 6 - high heating load and low cooling load, CID 7 - medium heating load and medium cooling load).

The resulting specific investment costs (USD_{2005}/m^2) after cost identification and cost transfer for all climate zones building types and vintages in the RoW regions can be found from Table 54 through Table 86, Annex 4.

ANNEX 3: RESULTS OF THE MODULE 2: COST ANALYSIS– CONSIDERATION OF THE NEGATIVE VALUES FOR SPECIFIC ADDITIONAL INVESTMENT COSTS

The results of the Module 2: Cost analysis described in the report are calculated in such a way that the negative values of the additional specific investment costs are disabled (default situation). This section provides the results of the Module 2: Cost analysis for the four major regions and the World when the negative values for additional specific investment costs are enabled (additional specific investment costs refer to the difference between the full specific investment cost of the advanced buildings under the Deep and Moderate efficiency scenario and the baseline full specific investment cost for the corresponding conventional buildings under the Frozen efficiency scenario).

Table 40 Total cumulative additional investment costs as compared to the total cumulative energy cost savings when negative value of specific additional investment cost is disabled (default)

	Excluding negative value of specific additional investment cost (USD_{2005}/m^2) (negative value disabled)				
	Deep efficiency scenario			**Moderate efficiency scenario**	
	Total cumulative additional investment costs until 2050	**Total cumulative energy cost savings until 2050**		**Total cumulative additional investment costs until 2050**	**Total cumulative energy cost savings until 2050**
Region	**tril. USD_{2005}**	**tril. USD_{2005}**		**tril. USD_{2005}**	**tril. USD_{2005}**
EU-27	5.1	9.8		5.0	7.5
USA	4.3	8.3		5.6	2.8
China	6.8	11.9		6.5	6.2
India	5.0	11.8		3.6	3.7
RoW	23.3	42.2		24.00	14.8
World	44.3	99.2		44.6	42.0

Table 41 Total cumulative additional investment costs as compared to the total cumulative energy cost savings when negative value of specific additional investment cost is enabled

	Including negative value of specific additional investment cost (USD_{2005}/m^2) (negative value enabled)				
	Deep efficiency scenario			**Moderate efficiency scenario**	
	Total cumulative additional investment costs until 2050	**Total cumulative energy cost savings until 2050**		**Total cumulative additional investment costs until 2050**	**Total cumulative energy cost savings until 2050**
Region	**tril. USD_{2005}**	**tril. USD_{2005}**		**tril. USD_{2005}**	**tril. USD_{2005}**
EU-27	3,67	9,8		3,64	7,49
USA	3,24	8,29		5,49	2,8
China	4,46	11,92		5,02	6,19
India	3,54	11,78		3,22	3,72
RoW	20,90	42,17		28,25	14,83
World	31,90	99,21		40,76	41,98

Table 41 as compared to the default (Table 40) shows that enabling the negative value of the specific additional investment costs results in a decrease in the total cumulative additional investment costs in all regions under the Deep efficiency scenario and in some regions under the Moderate efficiency scenario. The difference between the default and the results with the negative value enabled is more significant in the Deep efficiency scenario due to the larger deployment of the advanced buildings, which often show negative additional specific investment costs when compared to the baseline costs of the non-advanced buildings.

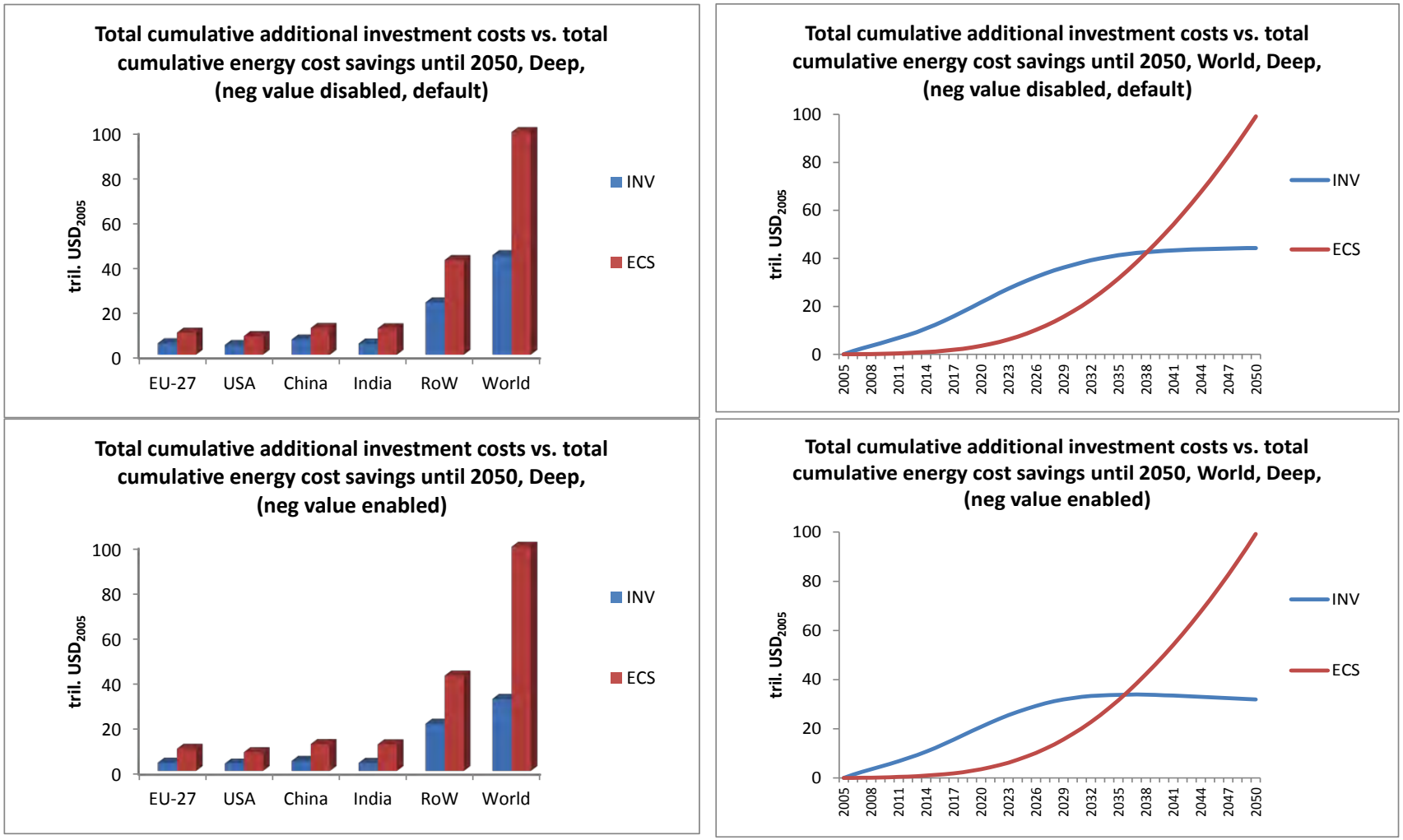
Under the Deep efficiency scenario the difference ranges between -10% and -34% as compared to the default total investment needs with negative value disabled. The most significant difference under the Deep scenario occurs in the China (-34%) and India (-29%). Average decrease for the World as a whole is -28% as compared to the default (when negative value is disabled). This means that if the negative values are considered, the total investment needs for the Deep scenario are more than one fourth lower than the default.

The average decrease of the total investment needs for the World under the Moderate scenario is -9% as compared to the default, three times lower than that of the Deep scenario (the difference ranges from -2% to -27%). The reason for that is both minimal proliferation of advanced buildings as well as negative additional specific investment costs in some cases. The largest decrease is in EU-27 (-27%) and in China (-22% as compared to default). The decrease in EU-27 is understandable due to the fact that this is the only region where advanced buildings are expected even under the Moderate scenario.

The changes in the results due to enabling negative value in specific additional investment costs (USD_{2005}/m^2) do not change the fact whether the scenario is cost-effective in the specific region or not (see Figure 51 and Figure 52). This is so under the Deep scenario, which is already cost-effective under the default case for all regions. Nevertheless, inclusion of negative values improves the cost-effectiveness of those regions which are cost-effective already under default situation (all regions under Deep scenario, EU-27 under Moderate scenario).

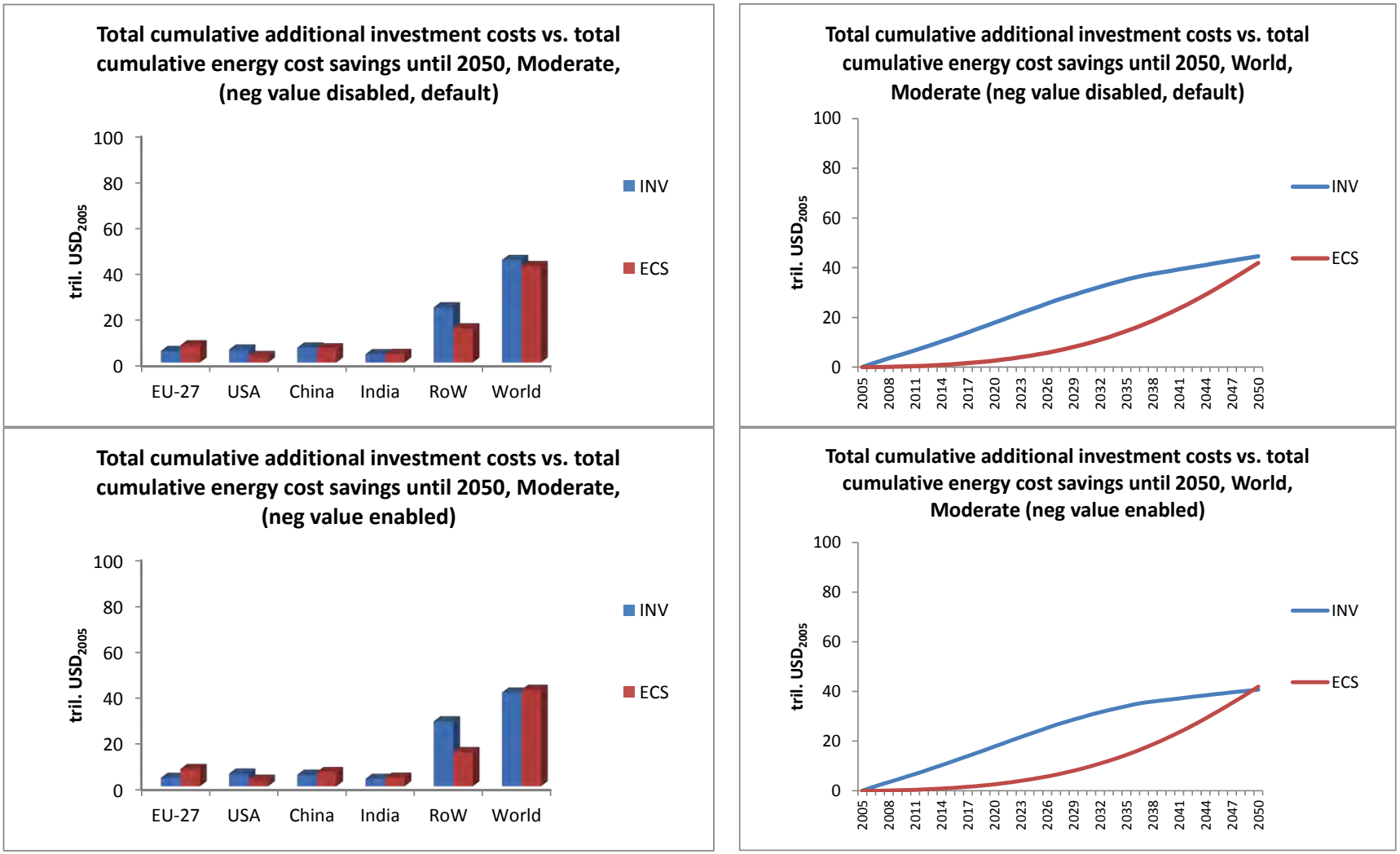
On the other hand, under the Moderate efficiency scenario the resulting decrease in total cumulative additional investment costs is not significant enough to lower the total investment needs to the level of the total cumulative energy cost savings, and thus, inclusion of the negative values does not make the scenario cost effective in any of the regions.

Figure 51 Total cumulative additional investment costs as compared to the total cumulative energy cost savings when negative value of specific additional investment cost is disabled (default) or enabled, Deep efficiency scenario until 2050



Note: INV – total cumulative additional investment costs; ECS - total cumulative energy cost savings

Figure 52 Total cumulative additional investment costs as compared to the total cumulative energy cost savings when negative value of specific additional investment cost is disabled (default) or enabled, Moderate efficiency scenario until 2050



Note: INV – total cumulative additional investment costs; ECS - total cumulative energy cost savings

ANNEX 4: SPECIFIC INVESTMENT COSTS PER REGION AND BUILDING TYPE FOR ALL CLIMATE ZONES

Table 42 Specific investment costs per unit floor area in EU-27, all climate zones, SF

			SF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	1%	vHHD	1614	2099	815	1358	1614	2099	1086	1358	1614	2099	1086	1358
2	24%	HHD	1112	1571	561	935	1390	1571	748	935	1390	1571	748	935
3	4%	MHD/LHD	1172	1426	510	849	1262	1426	679	849	1262	1426	679	849
6	30%	HHD+LCD	576	1198	613	1021	827	1198	817	1021	827	1198	817	1021
7	2%	MHD+MCD	1172	1249	768	1281	1262	1249	1025	1281	1262	1249	1025	1281
8	26%	MHD+LCD	831	887	545	909	855	887	727	909	855	887	727	909
9	6%	LHD + MCD	1172	1249	768	1281	1204	1249	1025	1281	1204	1249	1025	1281
10	2%	LHD + LCD	1172	1249	768	1281	1204	1249	1025	1281	1204	1249	1025	1281
12	0.28%	HCD	1172	1249	768	1281	1204	1249	1025	1281	1204	1249	1025	1281
15	1%	HCD + DH	1172	1249	768	1281	1204	1249	1025	1281	1204	1249	1025	1281
16	1%	LCD / MCD + DH	1172	1249	768	1281	1204	1249	1025	1281	1204	1249	1025	1281
17	3%	H + C + D	1172	1249	768	1281	1204	1249	1025	1281	1204	1249	1025	1281

Table 43 Specific investment costs per unit floor area in EU-27, all climate zones, MF

			MF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	1%	vHHD	1838	2017	542	903	2172	2017	722	903	2172	2017	722	903
2	24%	HHD	1223	1342	361	601	1223	1342	481	601	1223	1342	481	601
3	4%	MHD / LHD	465	995	206	344	888	995	275	344	888	995	275	344
6	30%	HHD + LCD	465	995	206	344	888	995	275	344	888	995	275	344
7	2%	MHD + MCD	1600	2289	287	479	2043	2289	383	479	2043	2289	383	479
8	26%	MHD + LCD	769	1643	206	344	1467	1643	275	344	1467	1643	275	344
9	6%	LHD + MCD	769	1643	206	344	1467	1643	275	344	1467	1643	275	344
10	2%	LHD + LCD	769	1643	206	344	1467	1643	275	344	1467	1643	275	344
12	0.28%	HCD	1397	1938	243	406	1730	1938	324	406	1730	1938	324	406
15	1%	HCD + DH	1397	2289	287	479	2043	2289	383	479	2043	2289	383	479
16	1%	LCD/MCD + DH	1397	3017	379	631	2693	3017	505	631	2693	3017	505	631
17	3%	H + C + D	1568	2428	305	508	2167	2428	406	508	2167	2428	406	508

Table 44 Specific investment costs per unit floor area in EU-27, all climate zones, C&P

			C&P											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	1%	vHHD	1548	2725	332	553	1740	2725	443	553	1740	2725	443	553
2	24%	HHD	1711	1391	332	553	1711	1391	443	553	1711	1391	443	553
3	4%	MHD / LHD	1703	1514	493	821	1711	1514	657	821	1711	1514	657	821
6	30%	HHD + LCD	1082	1939	493	821	1711	1939	657	821	1711	1939	657	821
7	2%	MHD + MCD	1576	2825	622	1037	1974	2825	830	1037	1974	2825	830	1037
8	26%	MHD + LCD	1248	2073	493	821	1974	2073	657	821	1974	2073	657	821
9	6%	LHD + MCD	1799	2988	493	821	2389	2988	657	821	2389	2988	657	821
10	2%	LHD + LCD	1501	2493	593	988	2352	2493	790	988	2352	2493	790	988
12	0.28%	HCD	1374	1943	542	904	1741	1943	723	904	1741	1943	723	904
15	1%	HCD + DH	1576	2230	622	1037	1974	2230	830	1037	1974	2230	830	1037
16	1%	LCD / MCD + DH	1931	2732	762	1270	2529	2732	1016	1270	2529	2732	1016	1270
17	3%	H + C + D	1447	2047	571	952	1729	2047	762	952	1729	2047	762	952

Table 45 Specific investment costs per unit floor area in the USA, all climate zones, SF

			SF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	1.3%	vHHD	1404	1538	610	1017	1461	1538	813	1017	1461	1538	813	1017
2	4.4%	HHD	1404	1538	610	1017	1461	1538	813	1017	1461	1538	813	1017
4	0.6%	vHHD + LCD	1404	1538	610	1017	1461	1538	813	1017	1461	1538	813	1017
6	26.3%	HHD + LCD	1450	1588	610	1017	1509	1588	813	1017	1509	1588	813	1017
7	1.3%	MHD + MCD	1450	1856	597	995	1478	1856	796	995	1478	1856	796	995
8	3.2%	MHD + LCD	1450	2124	584	974	1446	2124	779	974	1446	2124	779	974
9	8.5%	LHD + MCD	1390	2124	584	974	1446	2124	779	974	1446	2124	779	974
10	0.2%	LHD + LCD	1390	2124	584	974	1446	2124	779	974	1446	2124	779	974
12	0.1%	HCD	1163	1778	489	816	1211	1778	652	816	1211	1778	652	816
15	8.8%	HCD	1163	1778	489	816	1211	1778	652	816	1211	1778	652	816
17	45.4%	H, C, D	1465	1604	441	736	1092	1604	589	736	1092	1604	589	736

Table 46 Specific investment costs per unit floor area in the USA, all climate zones, MF

			MF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	1.31%	vHHD	1486	1784	647	1125	1497	1784	900	1125	1497	1784	900	1125
2	4.44%	HHD	1486	1784	647	1125	1497	1784	900	1125	1497	1784	900	1125
4	0.59%	vHHD + LCD	1519	1856	673	1170	1558	1856	936	1170	1558	1856	936	1170
6	26.27%	HHD + LCD	1551	1928	699	1216	1619	1928	973	1216	1619	1928	973	1216
7	1.28%	MHD + MCD	1477	1888	699	1191	1585	1888	953	1191	1585	1888	953	1191
8	3.16%	MHD + LCD	1403	1848	699	1165	1551	1848	932	1165	1551	1848	932	1165
9	8.49%	LHD + MCD	1403	1848	699	1165	1551	1848	932	1165	1551	1848	932	1165
10	0.18%	LHD + LCD	1403	1848	699	1165	1551	1848	932	1165	1403	1848	932	1165
12	0.12%	HCD	1123	1247	472	786	1241	1247	629	786	1123	1247	629	786
15	8.76%	HCD	1123	1247	472	786	1241	1247	629	786	1241	1247	629	786
17	45.38%	H, C, D	1012	1450	549	914	1119	1450	731	914	1443	1450	731	914

Table 47 Specific investment costs per unit floor area in the USA, all climate zones, C&P

			C&P											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	1.31%	vHHD	1209	1656	652	1086	1342	1656	869	1086	1342	1656	869	1086
2	4.44%	HHD	1209	1656	652	1086	1342	1656	869	1086	1342	1656	869	1086
4	0.59%	vHHD + LCD	1285	1750	692	1154	1362	1750	923	1154	1362	1750	923	1154
6	26.27%	HHD + LCD	1361	1845	733	1222	1382	1845	995	1222	1382	1845	995	1222
7	1.28%	MHD + MCD	1353	1809	644	1073	1451	1809	859	1073	1451	1809	859	1073
8	3.16%	MHD + LCD	1346	1772	554	924	1451	1772	739	924	1451	1772	739	924
9	8.49%	LHD + MCD	1378	1772	554	924	1390	1772	739	924	1390	1772	739	924
10	0.18%	LHD + LCD	1346	1772	554	924	1451	1772	739	924	1451	1772	739	924
12	0.12%	HCD	1346	1706	938	1563	1451	1706	1250	1563	1451	1706	1250	1563
15	8.76%	HCD	1148	1706	938	1563	1242	1706	1250	1563	1242	1706	1250	1563
17	45.38%	H, C, D	1346	1685	1040	1733	1377	1685	1386	1733	1377	1685	1386	1733

Table 48 Specific investment costs per unit floor area in China, all climate zones, SF

			SF											
			Frozen				Moderate				Deep			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	2%	vHHD	461	635	291	485	508	635	388	485	508	635	388	485
2	1%	HHD	461	635	291	485	508	635	388	485	508	635	388	485
3	0%	MHD / LHD	415	572	262	436	457	572	349	436	457	572	349	436
4	6%	vHHD + LCD	461	635	291	485	508	635	388	485	508	635	388	485
5	0%	HHD + MCD	389	699	320	533	559	699	426	533	559	699	426	533
6	11%	HHD+LCD	353	635	291	485	508	635	388	485	508	635	388	485
7	0%	MHD + MCD	353	635	291	485	508	635	388	485	508	635	388	485
8	5%	MHD + LCD	353	635	291	485	508	635	388	485	508	635	388	485
9	1%	LHD + MCD	318	572	262	436	457	572	349	436	457	572	349	436
10	2%	LHD + LCD	318	572	262	436	457	572	349	436	457	572	349	436
12	0%	HCD	436	511	205	342	508	511	274	342	508	511	274	342
13	0%	LMC / MCD	318	572	262	436	457	572	349	436	457	572	349	436
14	0%	vHCD + DH	436	511	205	342	508	511	274	342	508	511	274	342
15	9%	HCD + DH	436	511	205	342	508	511	274	342	508	511	274	342
17	62%	H + C + DH	461	511	205	342	508	511	274	342	508	511	274	342

Table 49 Specific investment costs per unit floor area in China, all climate zones, MF

			MF											
			Frozen				Moderate				Deep			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	2%	vHHD	325	473	137	228	441	473	182	228	441	473	182	228
2	1%	HHD	325	473	137	228	441	473	182	228	441	473	182	228
3	0%	MHD / LHD	292	426	123	205	397	426	164	205	397	426	164	205
4	6%	vHHD + LCD	325	473	137	228	441	473	182	228	441	473	182	228
5	0%	HHD + MCD	357	520	150	251	485	520	201	251	485	520	201	251
6	11%	HHD+LCD	325	473	137	228	441	473	182	228	441	473	182	228
7	0%	MHD + MCD	325	473	137	228	441	473	182	228	441	473	182	228
8	5%	MHD + LCD	325	473	137	228	441	473	182	228	441	473	182	228
9	1%	LHD + MCD	292	426	123	205	397	426	164	205	397	426	164	205
10	2%	LHD + LCD	292	426	123	205	397	426	164	205	397	426	164	205
12	0%	HCD	325	361	206	279	441	361	223	279	441	361	223	279
13	0%	LCD/ MCD	292	426	123	205	397	426	164	205	397	426	164	205
14	0%	vHCD + DH	325	361	206	279	441	361	223	279	441	361	223	279
15	9%	HCD + DH	325	361	206	279	441	361	223	279	441	361	223	279
17	62%	H + C + DH	325	465	169	225	441	465	180	225	441	465	180	225

Table 50 Specific investment costs per unit floor area in China, all climate zones, C&P

			C&P											
			Frozen				Moderate				Deep			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	2%	vHHD	491	881	217	362	667	881	290	362	667	881	290	362
2	1%	HHD	491	881	217	362	667	881	290	362	667	881	290	362
3	0%	MHD / LHD	442	793	196	326	600	793	261	326	600	793	261	326
4	6%	vHHD + LCD	491	881	217	362	667	881	290	362	667	881	290	362
5	0%	HHD + MCD	540	969	239	398	734	969	319	398	734	969	319	398
6	11%	HHD+LCD	491	881	217	362	667	881	290	362	667	881	290	362
7	0%	MHD + MCD	491	881	217	362	667	881	290	362	667	881	290	362
8	5%	MHD + LCD	491	881	217	362	667	881	290	362	667	881	290	362
9	1%	LHD + MCD	442	793	196	326	600	793	261	326	600	793	261	326
10	2%	LHD + LCD	442	793	196	326	600	793	261	326	600	793	261	326
12	0%	HCD	722	1276	237	396	842	1276	316	396	842	1276	316	396
13	0%	LCD / MCD	442	793	196	326	600	793	261	326	600	793	261	326
14	0%	vHCD + DH	722	1276	237	396	842	1276	316	396	842	1276	316	396
15	9%	HCD + DH	722	1276	237	396	842	1276	316	396	842	1276	316	396
17	62%	H + C + DH	769	1424	181	302	842	1424	242	302	842	1424	242	302

Table 51 Specific investment costs per unit floor area in India, all climate zones, SF

			SF											
			Frozen				Moderate				Deep			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	1%	vHHD	300	751	150	250	375	751	200	250	375	751	200	250
2	2%	HHD	300	751	150	250	375	751	200	250	375	751	200	250
3	0%	MHD / LHD	286	676	172	287	338	676	229	287	338	676	229	287
8	1%	MHD + LCD	225	751	191	319	375	751	255	319	375	751	255	319
9	1%	LHD + MCD	225	676	172	287	338	676	229	287	338	676	229	287
10	1%	LHD + LCD	219	676	172	287	338	676	229	287	338	676	229	287
11	1%	VHCD	225	604	135	225	375	604	180	225	375	604	180	225
12	1%	HCD	300	604	135	225	375	604	180	225	375	604	180	225
13	2%	LCD / MCD	225	676	172	287	338	676	229	287	338	676	229	287
14	73%	vHCD + DH	300	604	135	225	375	604	180	225	375	604	180	225
15	16%	HCD + DH	300	604	135	225	375	604	180	225	375	604	180	225
16	1%	L CD/MCD + DH	224	544	122	203	338	544	162	203	338	544	162	203

Table 52 Specific investment costs per unit floor area in India, all climate zones, MF

			MF											
			Frozen				Moderate				Deep			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	1%	vHHD	224	560	90	150	325	560	120	150	325	560	120	150
2	2%	HHD	224	560	90	150	325	560	120	150	325	560	120	150
3	0%	MHD / LHD	201	504	81	135	293	504	108	135	293	504	108	135
8	1%	MHD + LCD	224	560	90	150	325	560	120	150	325	560	120	150
9	1%	LHD + MCD	201	504	81	135	293	504	108	135	293	504	108	135
10	1%	LHD + LCD	201	504	81	135	293	504	108	135	293	504	108	135
11	1%	vHCD	165	332	105	174	275	332	139	174	275	332	139	174
12	1%	HCD	224	332	105	184	325	332	139	184	325	332	139	184
13	2%	L / M CD	201	504	81	135	293	504	108	135	293	504	108	135
14	73%	vHCD + DH	165	332	105	174	275	332	139	174	275	332	139	174
15	16%	HCD + DH	165	332	105	174	275	332	139	174	275	332	139	174
16	1%	LCD/MCD + DH	148	298	94	157	248	298	125	157	248	298	125	157

Table 53 Specific investment costs per unit floor area in India, all climate zones, C&P

			C&P											
			Frozen				Moderate				Deep			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	1%	vHHD	400	1042	143	238	492	1042	190	238	492	1042	190	238
2	2%	HHD	400	1042	143	238	492	1042	190	238	492	1042	190	238
3	0%	MHD / LHD	305	937	129	214	443	937	171	214	443	937	171	214
8	1%	MHD + LCD	400	1042	143	238	492	1042	190	238	492	1042	190	238
9	1%	LHD + MCD	400	937	129	214	443	937	171	214	443	937	171	214
10	1%	LHD + LCD	305	937	129	214	443	937	171	214	443	937	171	214
11	1%	vHCD	450	796	150	250	525	796	200	250	525	796	200	250
12	1%	HCD	497	796	156	260	621	796	208	260	621	796	208	260
13	2%	LCD / MCD	305	937	129	214	443	937	171	214	443	937	171	214
14	73%	vHCD + DH	450	796	150	250	525	796	200	250	525	796	200	250
15	16%	HCD + DH	450	539	148	247	525	539	197	247	525	539	197	247
16	1%	LCD/MCD + DH	405	716	135	225	473	716	180	225	473	716	180	225

Table 54 Specific investment costs per unit floor area in AFR, all climate zones, SF

			SF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
9	0%	LHD+MCD	446	953	262	437	649	953	350	437	649	953	350	437
10	0%	LHD+LCD	446	953	262	437	649	953	350	437	649	953	350	437
11	6%	vHCD	425	953	262	437	649	953	350	437	649	953	350	437
12	33%	HCD	425	953	262	437	649	953	350	437	649	953	350	437
13	3%	LCD/MCD	425	953	262	437	649	953	350	437	649	953	350	437
14	51%	vHCD+DH	624	953	262	437	649	953	350	437	649	953	350	437
15	6%	HCD+DH	624	953	262	437	649	953	350	437	649	953	350	437

Table 55 Specific investment costs per unit floor area in AFR, all climate zones, MF

			MF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
9	0%	LHD+MCD	674	888	336	560	717	888	448	560	717	888	448	560
10	0%	LHD+LCD	674	888	336	560	717	888	448	560	717	888	448	560
11	6%	vHCD	674	749	283	472	717	749	378	472	717	749	378	472
12	33%	HCD	674	749	283	472	717	749	378	472	717	749	378	472
13	3%	LCD/MCD	674	749	283	472	717	749	378	472	717	749	378	472
14	51%	vHCD+DH	674	749	283	472	717	749	378	472	717	749	378	472
15	6%	HCD+DH	674	749	283	472	717	749	378	472	717	749	378	472

Table 56 Specific investment costs per unit floor area in AFR, all climate zones, C&P

			C&P											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
9	0%	LHD+MCD	878	1130	353	589	886	1130	471	589	886	1130	471	589
10	0%	LHD+LCD	878	1130	353	589	886	1130	471	589	886	1130	471	589
11	6%	vHCD	819	1217	669	1115	886	1217	892	1115	886	1217	892	1115
12	33%	HCD	819	1217	669	1115	886	1217	892	1115	886	1217	892	1115
13	3%	LCD/MCD	819	1217	669	1115	886	1217	892	1115	886	1217	892	1115
14	51%	vHCD+DH	819	1217	669	1115	886	1217	892	1115	886	1217	892	1115
15	6%	HCD+DH	819	1217	669	1115	886	1217	892	1115	886	1217	892	1115

Table 57 Specific investment costs per unit floor area in FSU, all climate zones, SF

			SF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	32%	vHHD	674	1208	618	1029	949	1208	823	1029	949	1208	823	1029
2	10%	HHD	674	1208	618	1029	949	1208	823	1029	949	1208	823	1029
4	7%	vHHD+LCD	674	1208	618	1029	949	1208	823	1029	949	1208	823	1029
5	1%	HHD+MCD	741	1329	679	1132	1044	1329	906	1132	1044	1329	906	1132
6	39%	HHD+LCD	674	1208	618	1029	949	1208	823	1029	949	1208	823	1029
7	6%	MHD+MCD	674	1208	618	1029	949	1208	823	1029	949	1208	823	1029
8	1%	MHD+LCD	674	1208	618	1029	949	1208	823	1029	949	1208	823	1029
9	1%	LHD+MCD	674	1208	618	1029	949	1208	823	1029	949	1208	823	1029
17	3%	H+C+DH	710	912	466	777	717	912	622	777	717	912	622	777

Table 58 Specific investment costs per unit floor area in FSU, all climate zones, MF

			MF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	32%	vHHD	1275	1555	418	696	1305	1555	557	696	1305	1555	557	696
2	10%	HHD	1275	1432	385	641	1305	1432	513	641	1305	1432	513	641
4	7%	vHHD+LCD	1275	1432	284	495	1305	1432	396	495	1305	1432	396	495
5	1%	HHD+MCD	1275	1432	284	495	1305	1432	396	495	1305	1432	396	495
6	39%	HHD+LCD	1275	1462	303	505	1305	1462	404	505	1305	1462	404	505
7	6%	MHD+MCD	1275	1462	303	505	1305	1462	404	505	1305	1462	404	505
8	1%	MHD+LCD	1154	1401	303	484	1251	1401	387	484	1251	1401	387	484
9	1%	LHD+MCD	1154	1401	303	484	1251	1401	387	484	1251	1401	387	484
17	3%	H+C+DH	833	1099	238	380	902	1099	304	380	902	1099	304	380

Table 59 Specific investment costs per unit floor area in FSU, all climate zones, C&P

			C&P											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	32%	vHHD	1250	2200	682	1137	1405	2200	909	1137	1405	2200	909	1137
2	10%	HHD	1266	1733	682	1137	1405	1733	909	1137	1405	1733	909	1137
4	7%	vHHD+LCD	888	1875	746	1243	1405	1875	1011	1243	1405	1875	1011	1243
5	1%	HHD+MCD	888	1875	746	1243	1405	1875	1011	1243	1405	1875	1011	1243
6	39%	HHD+LCD	888	1875	746	1243	1405	1875	1011	1243	1405	1875	1011	1243
7	6%	MHD+MCD	888	1875	746	1243	1405	1875	1011	1243	1405	1875	1011	1243
8	1%	MHD+LCD	888	1875	746	1243	1405	1875	1011	1243	1405	1875	1011	1243
9	1%	LHD+MCD	888	1875	746	1243	1405	1875	1011	1243	1405	1875	1011	1243
17	3%	H+C+DH	1070	2552	1173	1956	1420	2552	1565	1956	1420	2552	1565	1956

Table 60 Specific investment costs per unit floor area in LAM, all climate zones, SF

			SF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	0%	vHHD	791	866	344	573	823	866	458	573	823	866	458	573
2	2%	HHD	791	866	344	573	823	866	458	573	823	866	458	573
3	3%	MHD/LHD	791	866	344	573	823	866	458	573	823	866	458	573
7	0%	MHD+MCD	791	866	344	573	823	866	458	573	823	866	458	573
8	0%	MHD+LCD	791	866	344	573	823	866	458	573	823	866	458	573
9	1%	LHD+MCD	791	866	344	573	823	866	458	573	823	866	458	573
10	3%	LHD+LCD	791	866	344	573	823	866	458	573	823	866	458	573
11	0%	VHCD	1046	1598	440	733	1088	1598	586	733	1088	1598	586	733
12	21%	HCD	1046	1598	440	733	1088	1598	586	733	1088	1598	586	733
13	10%	LCD/MCD	1046	1598	440	733	1088	1598	586	733	1088	1598	586	733
14	33%	VHCD+DH	1046	1598	440	733	1088	1598	586	733	1088	1598	586	733
15	23%	HCD+DH	1046	1598	440	733	1088	1598	586	733	1088	1598	586	733
16	3%	LCD/MCD+DH	1046	1598	440	733	1088	1598	586	733	1088	1598	586	733
17	1%	H+C+DH	1104	1209	744	1240	823	1209	992	1240	823	1209	992	1240

Table 61 Specific investment costs per unit floor area in LAM, all climate zones, MF

			MF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	0%	vHHD	714	1005	227	378	844	1005	302	378	844	1005	302	378
2	2%	HHD	714	1005	227	378	844	1005	302	378	844	1005	302	378
3	3%	MHD/LHD	442	1005	175	291	844	1005	233	291	844	1005	233	291
7	0%	MHD+MCD	442	945	119	198	844	945	158	198	844	945	158	198
8	0%	MHD+LCD	442	945	119	198	844	945	158	198	844	945	158	198
9	1%	LHD+MCD	442	945	119	198	844	945	158	198	844	945	158	198
10	3%	LHD+LCD	442	945	119	198	844	945	158	198	844	945	158	198
11	0%	VHCD	1009	1120	424	707	1115	1120	565	707	1115	1120	565	707
12	21%	HCD	1009	1120	424	707	1115	1120	565	707	1115	1120	565	707
13	10%	LCD/MCD	1009	1120	424	707	1115	1120	565	707	1115	1120	565	707
14	33%	VHCD+DH	1009	1120	424	707	1115	1120	565	707	1115	1120	565	707
15	23%	HCD+DH	1009	1120	424	707	1115	1120	565	707	1115	1120	565	707
16	3%	LCD/MCD+DH	1009	1120	424	707	1115	1120	565	707	1115	1120	565	707
17	1%	H+C+DH	763	1093	414	689	844	1093	551	689	844	1093	551	689

Table 62 Specific investment costs per unit floor area in LAM, all climate zones, C&P

			C&P											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	0%	vHHD	1076	1893	587	978	1209	1893	782	978	1209	1893	782	978
2	2%	HHD	1071	1467	577	962	1189	1467	770	962	1189	1467	770	962
3	3%	MHD/LHD	1184	1052	342	571	1189	1052	456	571	1189	1052	456	571
7	0%	MHD+MCD	1178	1452	454	757	1189	1452	616	757	1189	1452	616	757
8	0%	MHD+LCD	1178	1452	454	757	1189	1452	616	757	1189	1452	616	757
9	1%	LHD+MCD	1178	1452	454	757	1189	1452	616	757	1189	1452	616	757
10	3%	LHD+LCD	1178	1452	454	757	1189	1452	616	757	1189	1452	616	757
11	0%	VHCD	993	1970	1050	1749	1074	1970	1400	1749	1074	1970	1400	1749
12	21%	HCD	993	1970	1050	1749	1074	1970	1400	1749	1074	1970	1400	1749
13	10%	LCD/MCD	993	1970	1050	1749	1074	1970	1400	1749	1074	1970	1400	1749
14	33%	vHCD+DH	993	1970	1050	1749	1074	1970	1400	1749	1074	1970	1400	1749
15	23%	HCD+DH	993	1970	1050	1749	1074	1970	1400	1749	1074	1970	1400	1749
16	3%	LCD/MCD+DH	993	1970	1050	1749	1074	1970	1400	1749	1074	1970	1400	1749
17	1%	H+C+DH	896	2137	983	1638	1189	2137	1310	1638	1189	2137	1310	1638

Table 63 Specific investment costs per unit floor area in MEA, all climate zones, SF

			SF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
6	3%	HHD+LCD	528	1574	805	1341	768	1574	1073	1341	768	1574	1073	1341
7	8%	MHD+MCD	528	1840	788	1313	752	1840	1051	1313	752	1840	1051	1313
8	6%	MHD+LCD	762	1165	717	1194	793	1165	955	1194	793	1165	955	1194
9	19%	LHD+MCD	762	1165	717	1194	793	1165	955	1194	793	1165	955	1194
11	11%	VHCD	1366	2088	575	958	1422	2088	766	958	1422	2088	766	958
12	24%	HCD	1366	2088	575	958	1422	2088	766	958	1422	2088	766	958
14	10%	vHCD+DH	1366	2088	575	958	1422	2088	766	958	1422	2088	766	958
15	18%	HCD+DH	1366	2088	575	958	1422	2088	766	958	1422	2088	766	958
16	0%	LCD/MCD+DH	1366	2088	575	958	1422	2088	766	958	1422	2088	766	958
17	1%	H+C+DH	804	880	541	902	599	880	722	902	599	880	722	902

Table 64 Specific investment costs per unit floor area in MEA, all climate zones, MF

			MF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
6	3%	HHD+LCD	770	1014	384	639	851	1014	511	639	851	1014	511	639
7	8%	MHD+MCD	770	1014	384	639	851	1014	511	639	851	1014	511	639
8	6%	MHD+LCD	770	1014	384	639	851	1014	511	639	851	1014	511	639
9	19%	LHD+MCD	770	1014	384	639	851	1014	511	639	851	1014	511	639
11	11%	VHCD	1125	1219	461	769	1214	1219	615	769	1214	1219	615	769
12	24%	HCD	1125	1219	461	769	1214	1219	615	769	1214	1219	615	769
14	10%	vHCD+DH	1125	1219	461	769	1214	1219	615	769	1214	1219	615	769
15	18%	HCD+DH	1125	1219	461	769	1214	1219	615	769	1214	1219	615	769
16	0%	LCD/MCD+DH	1125	1219	461	769	1214	1219	615	769	1214	1219	615	769
17	1%	H+C+DH	831	1190	450	750	918	1190	600	750	918	1190	600	750

Table 65 Specific investment costs per unit floor area in MEA, all climate zones, C&P

			C&P											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
6	3%	HHD+LCD	964	2035	809	1348	1524	2035	1097	1348	1524	2035	1097	1348
7	8%	MHD+MCD	1511	2035	809	1348	1524	2035	1097	1348	1524	2035	1097	1348
8	6%	MHD+LCD	1743	1847	809	1348	1759	1847	1097	1348	1759	1847	1097	1348
9	19%	LHD+MCD	1743	1847	809	1348	1759	1847	1097	1348	1759	1847	1097	1348
11	11%	VHCD	1287	1911	1051	1751	1392	1911	1401	1751	1392	1911	1401	1751
12	24%	HCD	1287	1911	1051	1751	1392	1911	1401	1751	1392	1911	1401	1751
14	10%	vHCD+DH	1287	1911	1051	1751	1392	1911	1401	1751	1392	1911	1401	1751
15	18%	HCD+DH	1287	1911	1051	1751	1392	1911	1401	1751	1392	1911	1401	1751
16	0%	LCD/MCD+DH	1287	1911	1051	1751	1392	1911	1401	1751	1392	1911	1401	1751
17	1%	H+C+DH	1162	2769	1273	2122	1541	2769	1698	2122	1541	2769	1698	2122

Table 66 Specific investment costs per unit floor area in PAO, all climate zones, SF

			SF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	0%	vHHD	2121	3158	1614	2691	2180	3158	2152	2691	2180	3158	2152	2691
2	2%	HHD	2121	3158	1614	2691	2180	3158	2152	2691	2180	3158	2152	2691
3	0%	MHD/LHD	2121	3158	1614	2691	2180	2262	1855	2319	2180	2262	1855	2319
6	7%	HHD+LCD	2121	3158	1614	2691	2180	3158	2152	2691	2180	3158	2152	2691
8	30%	MHD+LCD	2121	2262	1391	2319	2180	2262	1855	2319	2180	2262	1855	2319
9	3%	LHD+MCD	1284	1369	842	1404	1320	1369	1123	1404	1320	1369	1123	1404
10	3%	LHD+LCD	1284	1369	842	1404	1320	1369	1123	1404	1320	1369	1123	1404
11	0%	VHCD	1268	1938	533	889	1320	1938	711	889	1320	1938	711	889
12	1%	HCD	1268	1938	533	889	1320	1938	711	889	1320	1938	711	889
13	9%	LCD/MCD	1268	1938	533	889	1320	1938	711	889	1320	1938	711	889
14	0%	vHCD+DH	1268	1938	533	889	1320	1938	711	889	1320	1938	711	889
15	3%	HCD+DH	1268	1938	533	889	1320	1938	711	889	1320	1938	711	889
16	0%	LCD/MCD+DH	1268	1938	533	889	1320	1938	711	889	1320	1938	711	889
17	42%	H+C+DH	2924	3202	881	1469	2180	3202	1175	1469	2180	3202	1175	1469

Table 67 Specific investment costs per unit floor area in PAO, all climate zones, MF

			MF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	0%	vHHD	1784	2147	864	1440	1916	2147	1152	1440	1916	2147	1152	1440
2	2%	HHD	1784	2147	864	1440	1916	2147	1152	1440	1916	2147	1152	1440
3	0%	MHD/LHD	1784	2147	864	1440	1916	2147	1152	1440	1916	2147	1152	1440
6	7%	HHD+LCD	1784	2147	864	1440	1916	2147	1152	1440	1916	2147	1152	1440
8	30%	MHD+LCD	1784	2147	864	1440	1916	2147	1152	1440	1916	2147	1152	1440
9	3%	LHD+MCD	1736	2264	857	1428	1900	2264	1142	1428	1900	2264	1142	1428
10	3%	LHD+LCD	1736	2264	857	1428	1900	2264	1142	1428	1900	2264	1142	1428
11	0%	VHCD	1736	1909	722	1204	1900	1909	963	1204	1900	1909	963	1204
12	1%	HCD	1736	1909	722	1204	1900	1909	963	1204	1900	1909	963	1204
13	9%	LCD/MCD	1736	1909	722	1204	1900	1909	963	1204	1900	1909	963	1204
14	0%	vHCD+DH	1736	1909	722	1204	1900	1909	963	1204	1900	1909	963	1204
15	3%	HCD+DH	1736	1909	722	1204	1900	1909	963	1204	1900	1909	963	1204
16	0%	LCD/MCD+DH	1736	1909	722	1204	1900	1909	963	1204	1900	1909	963	1204
17	42%	H+C+DH	1784	2483	939	1566	1916	2483	1253	1566	1916	2483	1253	1566

Table 68 Specific investment costs per unit floor area in PAO, all climate zones, C&P

			C&P											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	0%	vHHD	2356	4146	1285	2142	2647	4146	1713	2142	2647	4146	1713	2142
2	2%	HHD	2345	3212	1264	2106	2603	3212	1685	2106	2603	3212	1685	2106
3	0%	MHD/LHD	2592	3179	750	1249	2603	3179	999	1249	2603	3179	999	1249
6	7%	HHD+LCD	1646	3475	1382	2303	2603	3475	1874	2303	2603	3475	1874	2303
8	30%	MHD+LCD	2580	3179	995	1658	2603	3179	1349	1658	2603	3179	1349	1658
9	3%	LHD+MCD	2171	2675	1088	1813	2190	2675	1475	1813	2190	2675	1475	1813
10	3%	LHD+LCD	2171	2675	1088	1813	2190	2675	1475	1813	2190	2675	1475	1813
11	0%	VHCD	2025	3008	1654	2756	2190	3008	2205	2756	2190	3008	2205	2756
12	1%	HCD	2025	3008	1654	2756	2190	3008	2205	2756	2190	3008	2205	2756
13	9%	LCD/MCD	2025	3008	490	2756	2190	3008	2205	2756	2190	3008	2205	2756
14	0%	vHCD+DH	2025	3008	1654	2756	2190	3008	2205	2756	2190	3008	2205	2756
15	3%	HCD+DH	2025	3008	1654	2756	2190	3008	2205	2756	2190	3008	2205	2756
16	0%	LCD/MCD+DH	2025	3008	1654	2756	2190	3008	2205	2756	2190	3008	2205	2756
17	42%	H+C+DH	1963	4679	2152	3586	2603	4679	2869	3586	2603	4679	2869	3586

Table 69 Specific investment costs per unit floor area in PAS, all climate zones, SF

			SF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	0%	vHHD	1161	1571	610	1016	1208	1571	813	1016	1208	1571	813	1016
2	0%	HHD	1161	1365	488	813	1208	1365	650	813	1208	1365	650	813
3	0%	MHD/LHD	838	1020	365	608	903	1020	486	608	903	1020	486	608
6	3%	HHD+LCD	608	1266	647	1079	874	1266	863	1079	874	1266	863	1079
8	1%	MHD+LCD	879	937	576	961	903	937	768	961	903	937	768	961
9	0%	LHD+MCD	868	1326	502	836	903	1326	669	836	903	1326	669	836
10	0%	LHD+LCD	868	1326	502	836	903	1326	669	836	903	1326	669	836
12	2%	HCD	492	753	207	345	512	753	276	345	512	753	276	345
13	0%	LCD/MCD	492	753	207	345	512	753	276	345	512	753	276	345
14	81%	vHCD+DH	492	753	207	345	512	753	276	345	512	753	276	345
15	7%	HCD+DH	492	753	207	345	512	753	276	345	512	753	276	345
17	5%	H+C+DH	1211	1326	365	608	903	1326	487	608	903	1326	487	608

Table 70 Specific investment costs per unit floor area in PAS, all climate zones, MF

			MF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	0%	vHHD	501	1242	334	556	1338	1242	445	556	1338	1242	445	556
2	0%	HHD	501	826	222	370	753	826	296	370	753	826	296	370
3	0%	MHD/LHD	523	613	222	370	547	613	296	370	547	613	296	370
6	3%	HHD+LCD	523	651	127	212	547	651	169	212	547	651	169	212
8	1%	MHD+LCD	864	1012	127	212	903	1012	169	212	903	1012	169	212
9	0%	LHD+MCD	864	1012	127	212	903	1012	169	212	903	1012	169	212
10	0%	LHD+LCD	864	1012	127	212	903	1012	169	212	903	1012	169	212
12	2%	HCD	398	415	157	261	413	415	209	261	413	415	209	261
13	0%	LCD/MCD	398	415	157	261	413	415	209	261	413	415	209	261
14	81%	vHCD+DH	398	415	157	261	413	415	209	261	413	415	209	261
15	7%	HCD+DH	398	415	157	261	413	415	209	261	413	415	209	261
17	5%	H+C+DH	864	1170	443	738	903	1170	590	738	903	1170	590	738

Table 71 Specific investment costs per unit floor area in PAS, all climate zones, C&P

			C&P											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	0%	vHHD	996	1752	543	905	1119	1752	724	905	1119	1752	724	905
2	0%	HHD	991	1358	534	890	1100	1358	712	890	1100	1358	712	890
3	0%	MHD/LHD	1096	1344	317	528	1100	1344	422	528	1100	1344	422	528
6	3%	HHD+LCD	696	1469	584	973	1100	1469	792	973	1100	1469	792	973
8	1%	MHD+LCD	1091	1344	421	701	1100	1344	570	701	1100	1344	570	701
9	0%	LHD+MCD	918	1131	460	766	926	1131	624	766	926	1131	624	766
10	0%	LHD+LCD	918	1131	460	766	926	1131	624	766	926	1131	624	766
12	2%	HCD	665	1417	779	1298	719	1417	1038	1298	719	1417	1038	1298
13	0%	LCD/MCD	665	1417	779	1298	719	1417	1038	1298	719	1417	1038	1298
14	81%	vHCD+DH	665	1417	779	1298	719	1417	1038	1298	719	1417	1038	1298
15	7%	HCD+DH	856	1272	699	1165	926	1272	932	1165	926	1272	932	1165
17	5%	H+C+DH	830	1978	910	1516	1100	1978	1213	1516	1100	1978	1213	1516

Table 72 Specific investment costs per unit floor area in CPA, all climate zones, SF

			SF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	2%	vHHD	461	635	291	485	508	635	388	485	508	635	388	485
2	1%	HHD	461	635	291	485	508	635	388	485	508	635	388	485
3	0%	MHD/LHD	415	572	262	436	457	572	349	436	457	572	349	436
4	5%	vHHD+LCD	461	635	291	485	508	635	388	485	508	635	388	485
5	0%	HHD+MCD	389	699	320	533	559	699	426	533	559	699	426	533
6	11%	HHD+LCD	353	635	291	485	508	635	388	485	508	635	388	485
7	0%	MHD+MCD	353	635	291	485	508	635	388	485	508	635	388	485
8	4%	MHD+LCD	353	635	291	485	508	635	388	485	508	635	388	485
9	1%	LHD+MCD	318	572	262	436	457	572	349	436	457	572	349	436
10	2%	LHD+LCD	318	572	262	436	457	572	349	436	457	572	349	436
12	0%	HCD	436	511	205	342	508	511	274	342	508	511	274	342
13	0%	LCD/MCD	318	572	262	436	457	572	349	436	457	572	349	436
14	4%	vHCD+DH	436	511	205	342	508	511	274	342	508	511	274	342
15	12%	HCD+DH	436	511	205	342	508	511	274	342	508	511	274	342
17	57%	H+C+DH	461	511	205	342	508	511	274	342	508	511	274	342

Table 73 Specific investment costs per unit floor area in CPA, all climate zones, MF

			MF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	2%	vHHD	325	473	137	228	441	473	182	228	441	473	182	228
2	1%	HHD	325	473	137	228	441	473	182	228	441	473	182	228
3	0%	MHD/LHD	292	426	123	205	397	426	164	205	397	426	164	205
4	5%	vHHD+LCD	325	473	137	228	441	473	182	228	441	473	182	228
5	0%	HHD+MCD	357	520	150	251	485	520	201	251	485	520	201	251
6	11%	HHD+LCD	325	473	137	228	441	473	182	228	441	473	182	228
7	0%	MHD+MCD	325	473	137	228	441	473	182	228	441	473	182	228
8	4%	MHD+LCD	325	473	137	228	441	473	182	228	441	473	182	228
9	1%	LHD+MCD	292	426	123	205	397	426	164	205	397	426	164	205
10	2%	LHD+LCD	292	426	123	205	397	426	164	205	397	426	164	205
12	0%	HCD	325	361	206	279	441	361	223	279	441	361	223	279
13	0%	LCD/MCD	292	426	123	205	397	426	164	205	397	426	164	205
14	4%	vHCD+DH	325	361	206	279	441	361	223	279	441	361	223	279
15	12%	HCD+DH	325	361	206	279	441	361	223	279	441	361	223	279
17	57%	H+C+DH	325	465	169	225	441	465	180	225	441	465	180	225

Table 74 Specific investment costs per unit floor area in CPA, all climate zones, C&P

			C&P											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	2%	vHHD	491	881	217	362	667	881	290	362	667	881	290	362
2	1%	HHD	491	881	217	362	667	881	290	362	667	881	290	362
3	0%	MHD/LHD	442	793	196	326	600	793	261	326	600	793	261	326
4	5%	vHHD+LCD	491	881	217	362	667	881	290	362	667	881	290	362
5	0%	HHD+MCD	540	969	239	398	734	969	319	398	734	969	319	398
6	11%	HHD+LCD	491	881	217	362	667	881	290	362	667	881	290	362
7	0%	MHD+MCD	491	881	217	362	667	881	290	362	667	881	290	362
8	4%	MHD+LCD	491	881	217	362	667	881	290	362	667	881	290	362
9	1%	LHD+MCD	442	793	196	326	600	793	261	326	600	793	261	326
10	2%	LHD+LCD	442	793	196	326	600	793	261	326	600	793	261	326
12	0%	HCD	722	1276	237	396	842	1276	316	396	842	1276	316	396
13	0%	LCD/MCD	442	793	196	326	600	793	261	326	600	793	261	326
14	4%	vHCD+DH	722	1276	237	396	842	1276	316	396	842	1276	316	396
15	12%	HCD+DH	722	1276	237	396	842	1276	316	396	842	1276	316	396
17	57%	H+C+DH	769	1424	181	302	842	1424	242	302	842	1424	242	302

Table 75 Specific investment costs per unit floor area in EEU, all climate zones, SF

			SF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
2	9%	HHD	1112	1571	561	935	1390	1571	748	935	1390	1571	748	935
6	69%	HHD+LCD	576	1198	613	1021	827	1198	817	1021	827	1198	817	1021
7	0%	MHD+MCD	1172	1249	768	1281	1262	1249	1025	1281	1262	1249	1025	1281
8	19%	MHD+LCD	831	887	545	909	855	887	727	909	855	887	727	909
17	4%	H+C+DH	1172	1249	768	1281	1204	1249	1025	1281	1204	1249	1025	1281

Table 76 Specific investment costs per unit floor area in EEU, all climate zones, MF

			MF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
2	9%	HHD	1223	1342	361	601	1223	1342	481	601	1223	1342	481	601
6	69%	HHD+LCD	465	995	206	344	888	995	275	344	888	995	275	344
7	0%	MHD+MCD	1600	2289	287	479	2043	2289	383	479	2043	2289	383	479
8	19%	MHD+LCD	769	1643	206	344	1467	1643	275	344	1467	1643	275	344
17	4%	H+C+DH	1568	2428	305	508	2167	2428	406	508	2167	2428	406	508

Table 77 Specific investment costs per unit floor area in EEU, all climate zones, C&P

			C&P											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
2	9%	HHD	1711	1391	332	553	1711	1391	443	553	1711	1391	443	553
6	69%	HHD+LCD	1082	1939	493	821	1711	1939	657	821	1711	1939	657	821
7	0%	MHD+MCD	1576	2825	622	1037	1974	2825	830	1037	1974	2825	830	1037
8	19%	MHD+LCD	1248	2073	493	821	1974	2073	657	821	1974	2073	657	821
17	4%	H+C+DH	1447	2047	571	952	1729	2047	762	952	1729	2047	762	952

Table 78 Total construction costs per unit floor area in NAM, all climate zones, SF

			SF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	4%	VHHD	1404	1538	610	1017	1461	1538	813	1017	1461	1538	813	1017
2	4%	HHD	1404	1538	610	1017	1461	1538	813	1017	1461	1538	813	1017
4	2%	vHHD+LCD	1404	1538	610	1017	1461	1538	813	1017	1461	1538	813	1017
6	28%	HHD+LCD	1450	1588	610	1017	1509	1588	813	1017	1509	1588	813	1017
7	1%	MHD+MCD	1450	1856	597	995	1478	1856	796	995	1478	1856	796	995
8	3%	MHD+LCD	1450	2124	584	974	1446	2124	779	974	1446	2124	779	974
9	8%	LHD+MCD	1390	2124	584	974	1446	2124	779	974	1446	2124	779	974
10	0%	LHD+LCD	1390	2124	584	974	1446	2124	779	974	1446	2124	779	974
12	0%	HCD	1163	1778	489	816	1211	1778	652	816	1211	1778	652	816
14	1%	vHCD+DH	1163	1778	489	816	1211	1778	652	816	1211	1778	652	816
15	8%	HCD+DH	1163	1778	489	816	1211	1778	652	816	1211	1778	652	816
17	40%	H+C+DH	1465	1604	441	736	1092	1604	589	736	1092	1604	589	736

Table 79 Specific investment costs per unit floor area in NAM, all climate zones, MF

			MF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	4%	VHHD	1486	1784	647	1125	1497	1784	900	1125	1497	1784	900	1125
2	4%	HHD	1486	1784	647	1125	1497	1784	900	1125	1497	1784	900	1125
4	2%	vHHD+LCD	1519	1856	673	1170	1558	1856	936	1170	1558	1856	936	1170
6	28%	HHD+LCD	1551	1928	699	1216	1619	1928	973	1216	1619	1928	973	1216
7	1%	MHD+MCD	1477	1888	699	1191	1585	1888	953	1191	1585	1888	953	1191
8	3%	MHD+LCD	1403	1848	699	1165	1551	1848	932	1165	1551	1848	932	1165
9	8%	LHD+MCD	1403	1848	699	1165	1551	1848	932	1165	1551	1848	932	1165
10	0%	LHD+LCD	1403	1848	699	1165	1551	1848	932	1165	1403	1848	932	1165
12	0%	HCD	1123	1247	472	786	1241	1247	629	786	1123	1247	629	786
14	1%	vHCD+DH	1123	1247	472	786	1241	1247	629	786	1241	1247	629	786
15	8%	HCD+DH	1123	1247	472	786	1241	1247	629	786	1241	1247	629	786
17	40%	H+C+DH	1012	1450	549	914	1119	1450	731	914	1443	1450	731	914

Table 80 Specific investment costs per unit floor area in NAM, all climate zones, C&P

			C&P											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	4%	VHHD	1209	1656	652	1086	1342	1656	869	1086	1342	1656	869	1086
2	4%	HHD	1209	1656	652	1086	1342	1656	869	1086	1342	1656	869	1086
4	2%	vHHD+LCD	1285	1750	692	1154	1362	1750	923	1154	1362	1750	923	1154
6	28%	HHD+LCD	1361	1845	733	1222	1382	1845	995	1222	1382	1845	995	1222
7	1%	MHD+MCD	1353	1809	644	1073	1451	1809	859	1073	1451	1809	859	1073
8	3%	MHD+LCD	1346	1772	554	924	1451	1772	739	924	1451	1772	739	924
9	8%	LHD+MCD	1378	1772	554	924	1390	1772	739	924	1390	1772	739	924
10	0%	LHD+LCD	1346	1772	554	924	1451	1772	739	924	1451	1772	739	924
12	0%	HCD	1346	1706	938	1563	1451	1706	1250	1563	1451	1706	1250	1563
14	1%	vHCD+DH	1346	1706	938	1563	1451	1706	1250	1563	1451	1706	1250	1563
15	8%	HCD+DH	1148	1706	938	1563	1242	1706	1250	1563	1242	1706	1250	1563
17	40%	H+C+DH	1346	1685	1040	1733	1377	1685	1386	1733	1377	1685	1386	1733

Table 81 Specific investment costs per unit floor area in SAS, all climate zones, SF

			SF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{50}	AR^{70+}	N^{BC}	AN^{70+}	R^{50}	AR^{70+}
1	2%	vHHD	300	751	150	250	375	751	200	250	375	751	200	250
2	3%	HHD	300	751	150	250	375	751	200	250	375	751	200	250
3	0%	MHD/LHD	286	676	172	287	338	676	229	287	338	676	229	287
6	0%	HHD+LCD	243	751	191	319	375	751	255	319	375	751	255	319
7	1%	MHD+MCD	243	751	191	319	375	751	255	319	375	751	255	319
8	2%	MHD+LCD	225	751	191	319	375	751	255	319	375	751	255	319
9	2%	LHD+MCD	225	676	172	287	338	676	229	287	338	676	229	287
10	1%	LHD+LCD	219	676	172	287	338	676	229	287	338	676	229	287
11	0%	vHCD	225	604	135	225	375	604	180	225	375	604	180	225
12	1%	HCD	300	604	135	225	375	604	180	225	375	604	180	225
13	1%	LCD/MCD	225	676	172	287	338	676	229	287	338	676	229	287
14	67%	vHCD+DH	300	604	135	225	375	604	180	225	375	604	180	225
15	18%	HCD+DH	300	604	135	225	375	604	180	225	375	604	180	225
16	0%	LCD/MCD+DH	224	544	122	203	338	544	162	203	338	544	162	203
17	1%	H+C+DH	318	604	135	225	375	604	180	225	375	604	180	225

Table 82 Specific investment costs per unit floor area in SAS, all climate zones, MF

			MF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	2%	vHHD	224	560	90	150	325	560	120	150	325	560	120	150
2	3%	HHD	224	560	90	150	325	560	120	150	325	560	120	150
3	0%	MHD/LHD	201	504	81	135	293	504	108	135	293	504	108	135
6	0%	HHD+LCD	165	435	69	142	275	435	114	142	275	435	114	142
7	1%	MHD+MCD	165	435	69	142	275	435	114	142	275	435	114	142
8	2%	MHD+LCD	224	560	90	150	325	560	120	150	325	560	120	150
9	2%	LHD+MCD	201	504	81	135	293	504	108	135	293	504	108	135
10	1%	LHD+LCD	201	504	81	135	293	504	108	135	293	504	108	135
11	0%	vHCD	165	332	105	174	275	332	139	174	275	332	139	174
12	1%	HCD	224	332	105	184	325	332	139	184	325	332	139	184
13	1%	LCD/MCD	201	504	81	135	293	504	108	135	293	504	108	135
14	67%	vHCD+DH	165	332	105	174	275	332	139	174	275	332	139	174
15	18%	HCD+DH	165	332	105	174	275	332	139	174	275	332	139	174
16	0%	LCD/MCD+DH	148	298	94	157	248	298	125	157	248	298	125	157
17	1%	H+C+DH	165	428	86	140	275	428	112	140	275	428	112	140

Table 83 Specific investment costs per unit floor area in SAS, all climate zones, C&P

			C&P											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	2%	vHHD	400	1042	143	238	492	1042	190	238	492	1042	190	238
2	3%	HHD	400	1042	143	238	492	1042	190	238	492	1042	190	238
3	0%	MHD/LHD	305	937	129	214	443	937	171	214	443	937	171	214
6	0%	HHD+LCD	306	372	136	226	416	372	181	226	416	372	181	226
7	1%	MHD+MCD	306	372	136	226	416	372	181	226	416	372	181	226
8	2%	MHD+LCD	400	1042	143	238	492	1042	190	238	492	1042	190	238
9	2%	LHD+MCD	400	937	129	214	443	937	171	214	443	937	171	214
10	1%	LHD+LCD	305	937	129	214	443	937	171	214	443	937	171	214
11	0%	vHCD	450	796	89	148	525	796	200	250	525	796	200	148
12	1%	HCD	497	796	156	260	621	796	208	260	621	796	208	260
13	1%	LCD/MCD	305	937	129	214	443	937	171	214	443	937	171	214
14	67%	vHCD+DH	450	796	89	148	525	796	200	250	525	796	200	148
15	18%	HCD+DH	450	539	148	247	525	539	197	247	525	539	197	247
16	0%	LCD/MCD+DH	405	716	80	133	473	716	180	225	473	716	180	133
17	1%	H+C+DH	480	601	113	189	525	601	151	189	525	601	151	189

Table 84 Specific investment costs per unit floor area in WEU, all climate zones, SF

			SF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	2%	vHHD	1614	2099	815	1358	1614	2099	1086	1358	1614	2099	1086	1358
2	28%	HHD	1112	1571	561	935	1390	1571	748	935	1390	1571	748	935
3	5%	MHD/LHD	1172	1426	510	849	1262	1426	679	849	1262	1426	679	849
6	20%	HHD+LCD	576	1198	613	1021	827	1198	817	1021	827	1198	817	1021
7	3%	MHD+MCD	1172	1249	768	1281	1262	1249	1025	1281	1262	1249	1025	1281
8	28%	MHD+LCD	831	887	545	909	855	887	727	909	855	887	727	909
9	8%	LHD+MCD	1172	1249	768	1281	1204	1249	1025	1281	1204	1249	1025	1281
10	2%	LHD+LCD	1172	1249	768	1281	1204	1249	1025	1281	1204	1249	1025	1281
12	0%	HCD	1172	1249	768	1281	1204	1249	1025	1281	1204	1249	1025	1281
15	1%	HCD+DH	1172	1249	768	1281	1204	1249	1025	1281	1204	1249	1025	1281
16	1%	LCD/MCD+DH	1172	1249	768	1281	1204	1249	1025	1281	1204	1249	1025	1281
17	2%	H+C+DH	1172	1249	768	1281	1204	1249	1025	1281	1204	1249	1025	1281

Table 85 Specific investment costs per unit floor area in WEU, all climate zones, MF

			MF											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	2%	vHHD	1838	2017	542	903	2172	2017	722	903	2172	2017	722	903
2	28%	HHD	1223	1342	361	601	1223	1342	481	601	1223	1342	481	601
3	5%	MHD/LHD	465	995	206	344	888	995	275	344	888	995	275	344
6	20%	HHD+LCD	465	995	206	344	888	995	275	344	888	995	275	344
7	3%	MHD+MCD	1600	2289	287	479	2043	2289	383	479	2043	2289	383	479
8	28%	MHD+LCD	769	1643	206	344	1467	1643	275	344	1467	1643	275	344
9	8%	LHD+MCD	769	1643	206	344	1467	1643	275	344	1467	1643	275	344
10	2%	LHD+LCD	769	1643	206	344	1467	1643	275	344	1467	1643	275	344
12	0%	HCD	1397	1938	243	406	1730	1938	324	406	1730	1938	324	406
15	1%	HCD+DH	1397	2289	287	479	2043	2289	383	479	2043	2289	383	479
16	1%	LCD/MCD+DH	1397	3017	379	631	2693	3017	505	631	2693	3017	505	631
17	2%	H+C+DH	1568	2428	305	508	2167	2428	406	508	2167	2428	406	508

Table 86 Specific investment costs per unit floor area in WEU, all climate zones, C&P

			C&P											
			Frozen efficiency scenario				Moderate efficiency scenario				Deep efficiency scenario			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit	New	Advanced new	Retrofit	Advanced retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	2%	vHHD	1548	2725	332	553	1740	2725	443	553	1740	2725	443	553
2	28%	HHD	1711	1391	332	553	1711	1391	443	553	1711	1391	443	553
3	5%	MHD/LHD	1703	1514	493	821	1711	1514	657	821	1711	1514	657	821
6	20%	HHD+LCD	1082	1939	493	821	1711	1939	657	821	1711	1939	657	821
7	3%	MHD+MCD	1576	2825	622	1037	1974	2825	830	1037	1974	2825	830	1037
8	28%	MHD+LCD	1248	2073	493	821	1974	2073	657	821	1974	2073	657	821
9	8%	LHD+MCD	1799	2988	493	821	2389	2988	657	821	2389	2988	657	821
10	2%	LHD+LCD	1501	2493	593	988	2352	2493	790	988	2352	2493	790	988
12	0%	HCD	1374	1943	542	904	1741	1943	723	904	1741	1943	723	904
15	1%	HCD+DH	1576	2230	622	1037	1974	2230	830	1037	1974	2230	830	1037
16	1%	LCD/MCD+DH	1931	2732	762	1270	2529	2732	1016	1270	2529	2732	1016	1270
17	2%	H+C+DH	1447	2047	571	952	1729	2047	762	952	1729	2047	762	952

ANNEX 5: REGIONAL SPLIT

The World is split into 11 regions in the 3CSEP HEB model, which is based on GEA (Ürge-Vorsatz et al. 2011) and is the following:

North America (**NAM**): Canada, Guam, Puerto Rico, United States of America, Virgin Islands

Western Europe (**WEU**): Andorra, Austria, Azores, Belgium, Canary Islands, Channel Islands, Cyprus, Denmark, Faeroe Islands, Finland, France, Germany, Gibraltar, Greece, Greenland, Iceland, Ireland, Isle of Man, Italy, Liechtenstein, Luxembourg, Madeira, Malta, Monaco, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom

Pacific OECD (**PAO**): Australia, Japan, New Zealand

Central and Eastern Europe (**EEU**): Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Latvia, Lithuania, The former Yugoslav Rep. of Macedonia, Hungary, Poland, Romania, Slovak Republic, Slovenia, Yugoslavia

Formal Soviet Union (**FSU**) Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine, Uzbekistan

Centrally planned Asia and China (**CPA**): Cambodia, China (incl. Hong Kong), Korea (DPR), Laos (PDR), Mongolia, Viet Nam

South Asia (**SAS**): Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka

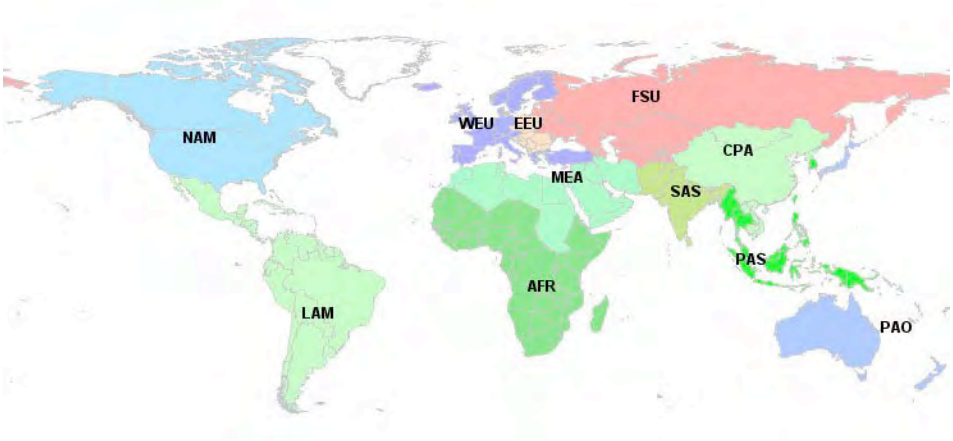
Other Pacific Asia (**PAS**): American Samoa, Brunei Darussalam, Fiji, French Polynesia, Gilbert-Kiribati, Indonesia, Malaysia, Myanmar, New Caledonia, Papua, New Guinea, Philippines, Republic of Korea, Singapore, Solomon Islands, Taiwan (China), Thailand, Tonga, Vanuatu, Western Samoa

Middle East and North Africa (**MEA**): Algeria, Bahrain, Egypt (Arab Republic), Iraq, Iran (Islamic Republic), Israel, Jordan, Kuwait, Lebanon, Libya/SPLAJ, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Syria (Arab Republic), Tunisia, United Arab Emirates, Yemen

Latin America and the Caribbean (**LAC**): Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, French Guyana, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Jamaica, Martinique, Mexico, Netherlands Antilles, Nicaragua, Panama, Paraguay, Peru, Saint Kitts and Nevis, Santa Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, Venezuela

Sub-Saharan Africa (**AFR**): Angola, Benin, Botswana, British Indian Ocean Territory, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Cote d'Ivoire, Congo, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Reunion, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Saint Helena, Swaziland, Tanzania, Togo, Uganda, Zaire, Zambia, Zimbabwe

Figure 53 Eleven regions considered by the model



Source: GEA, Ürge -Vorsatz et al. (2011)

ANNEX 6: FLOOR AREA FOR SPECIFIED REGIONS AND BUILDING VINTAGES

Figure 54 Total floor area of advanced new construction in the EU-27, Deep

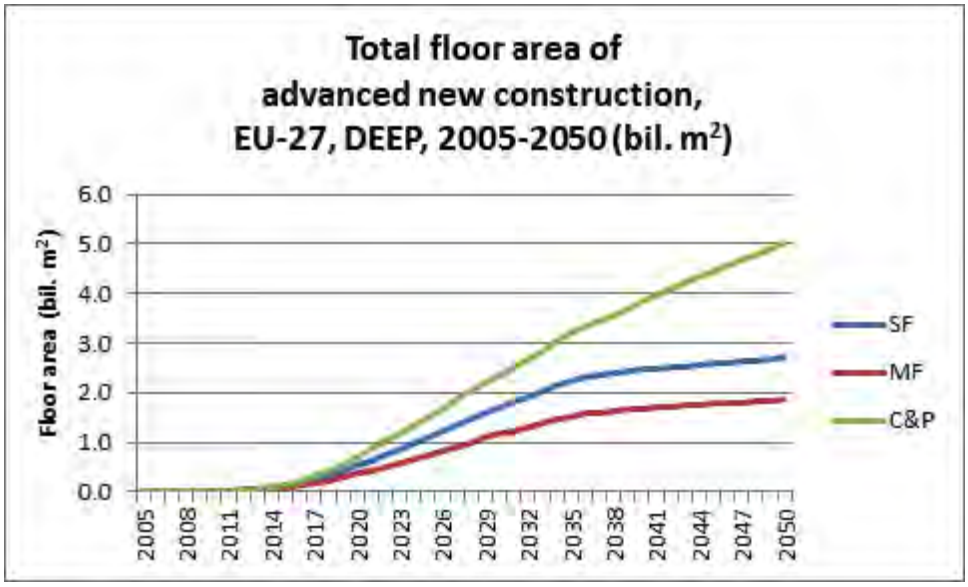


Figure 55 Total floor area of advanced retrofit in the EU-27, Deep

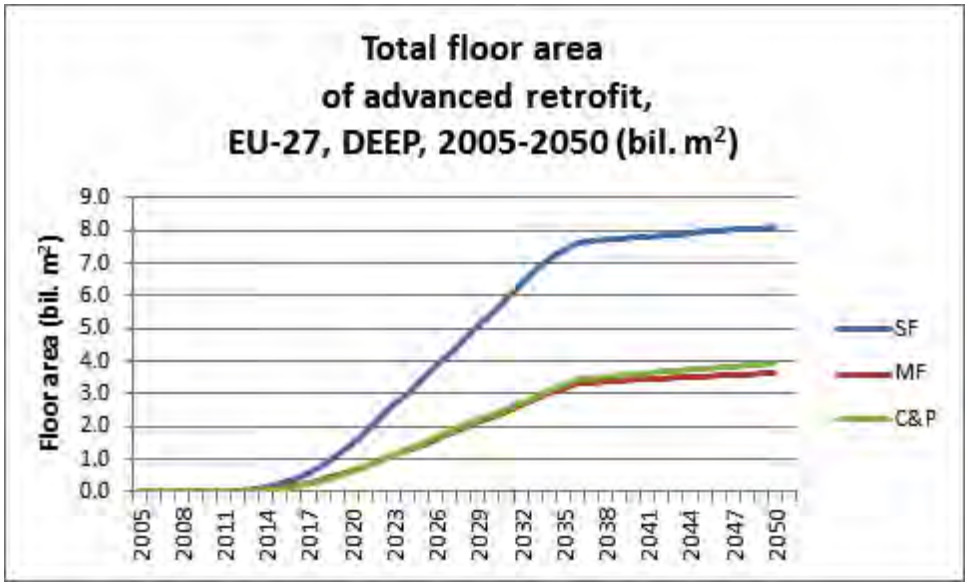


Figure 56 Floor area of advanced new construction in the EU-27, Moderate

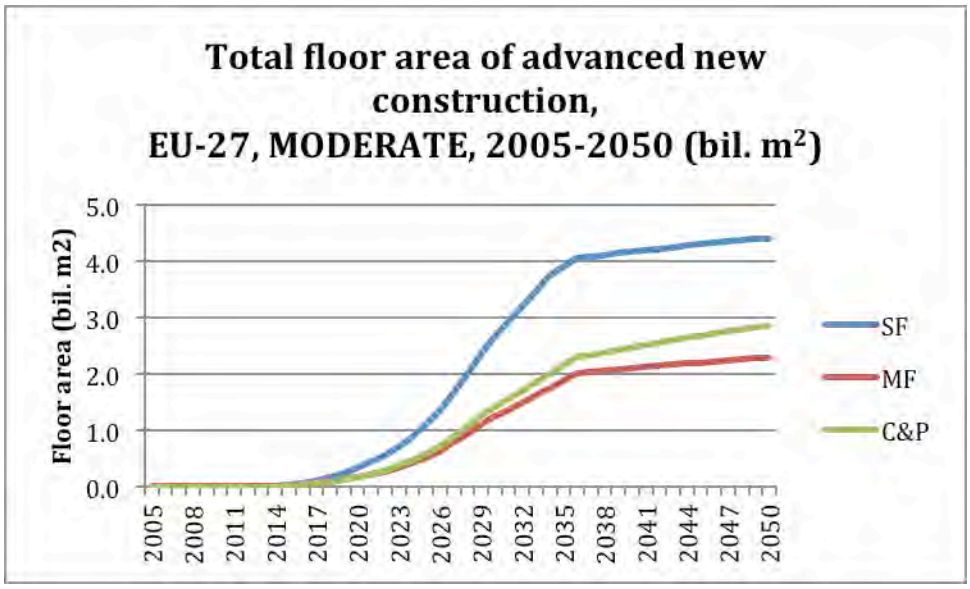


Figure 57 Floor area of advanced retrofit in the EU-27, Moderate

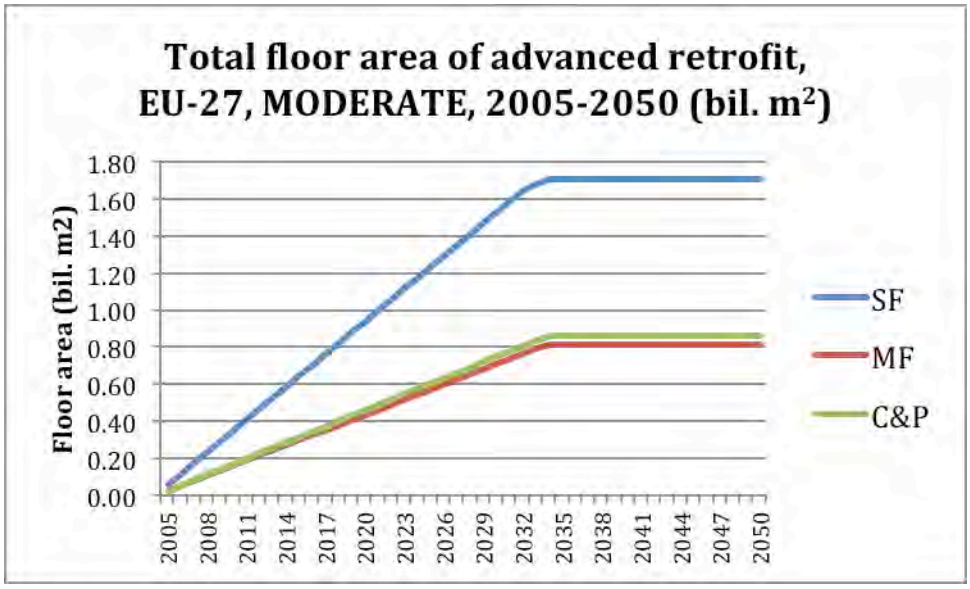


Figure 58 Floor area of advanced new construction in the USA, Deep

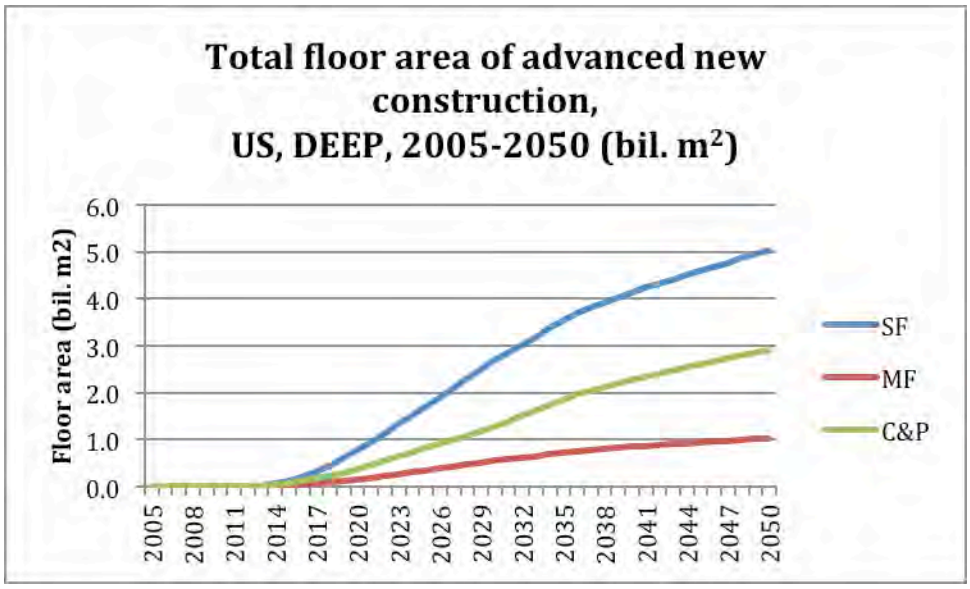


Figure 59 Floor area of advanced retrofit in the USA, Deep

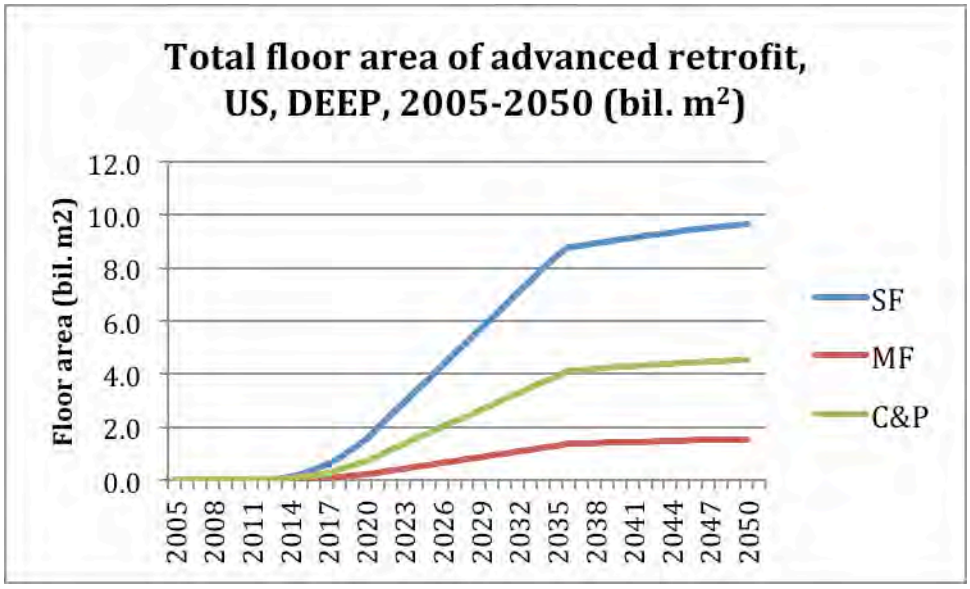


Figure 60 Floor area of advanced new construction in China, Deep

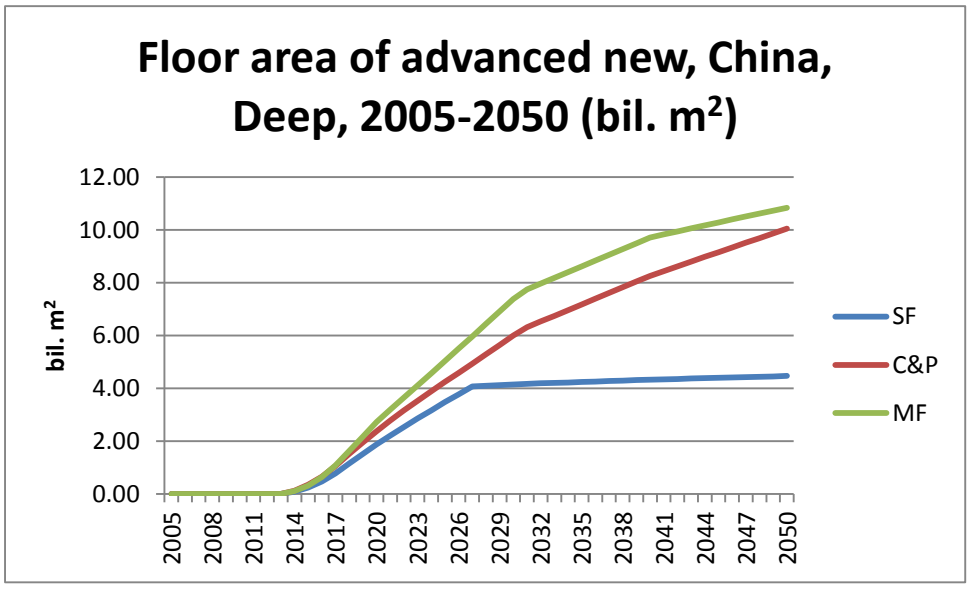


Figure 61 Floor area of advanced retrofit in China, Deep

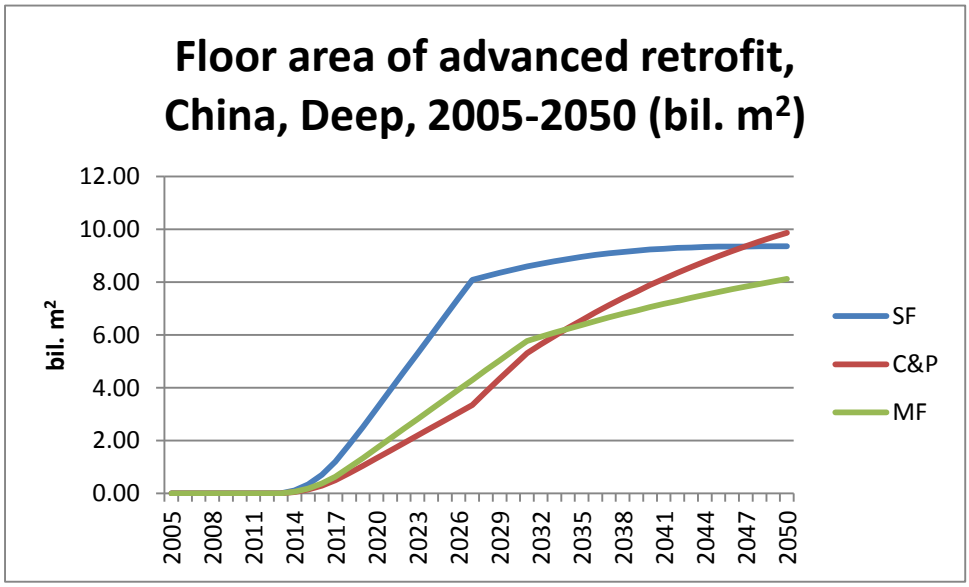


Figure 62 Floor area of advanced new construction in India, Deep

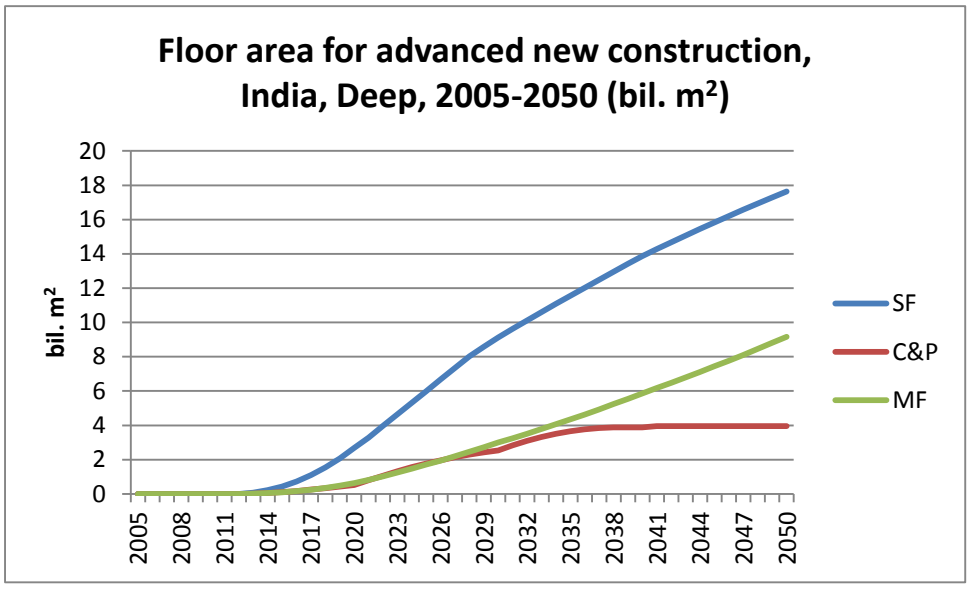


Figure 63 Floor area of advanced retrofit in India, Deep

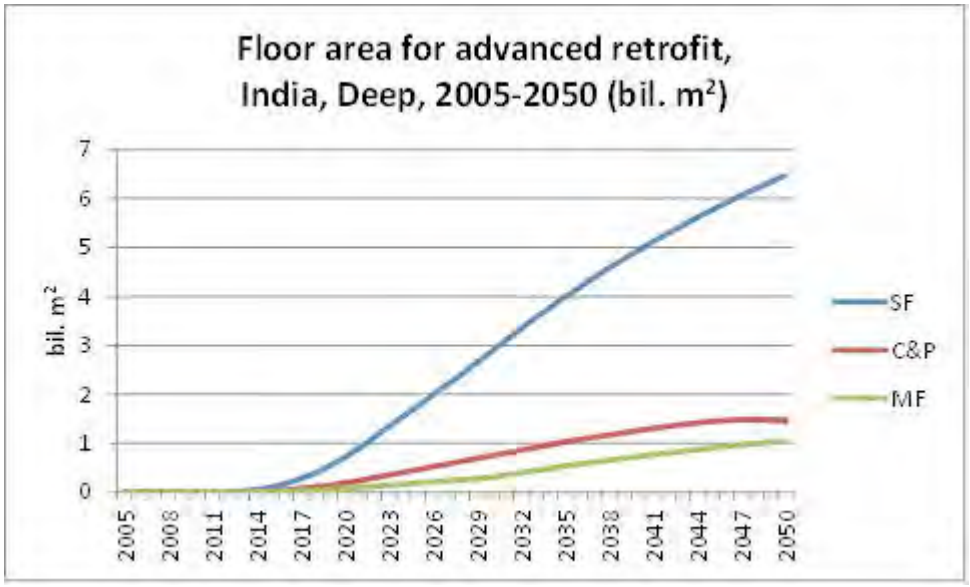


Figure 64 Floor area of advanced new construction, RoW, Deep

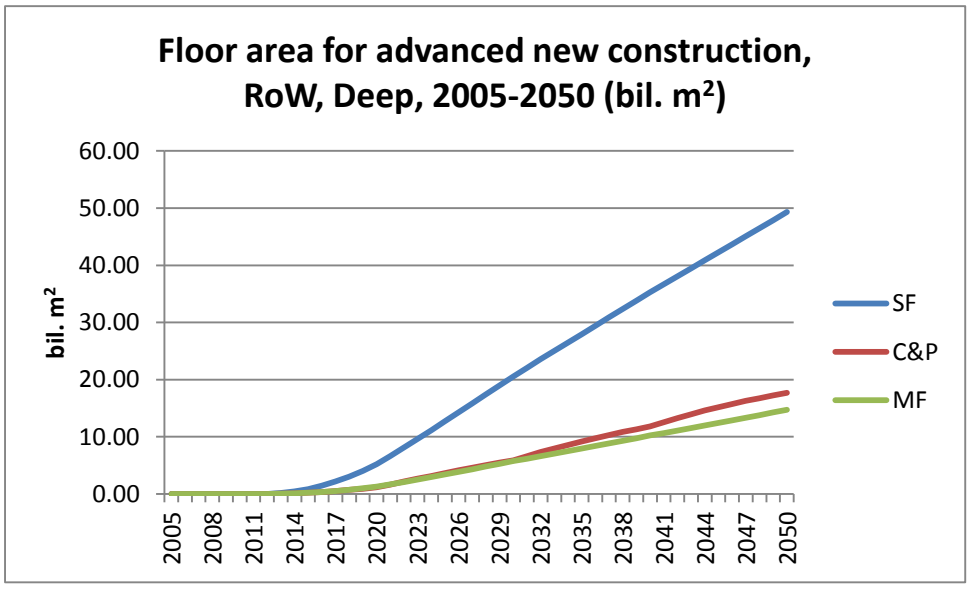


Figure 65 Floor area of advanced retrofit, RoW, Deep

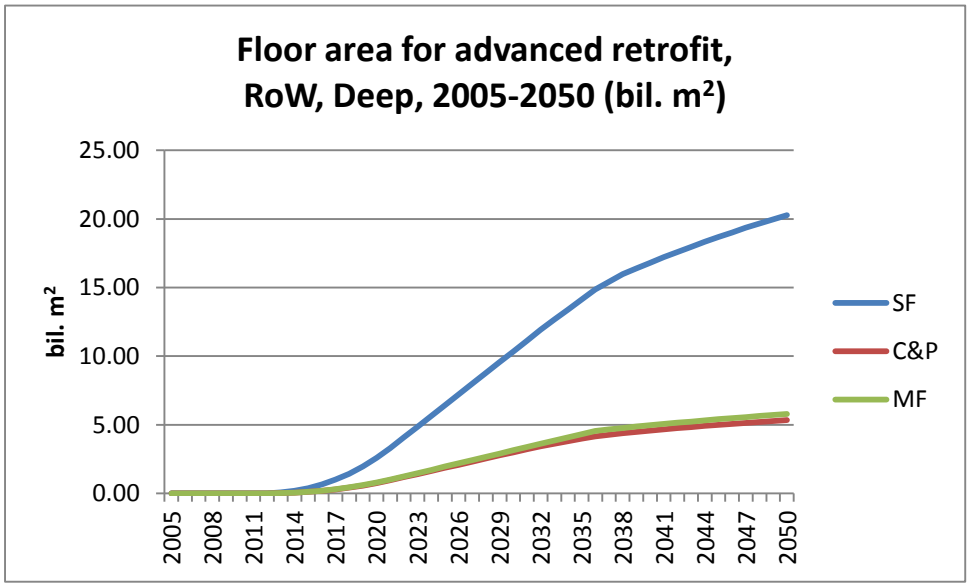


Figure 66 Floor area of advanced new construction, RoW, Moderate

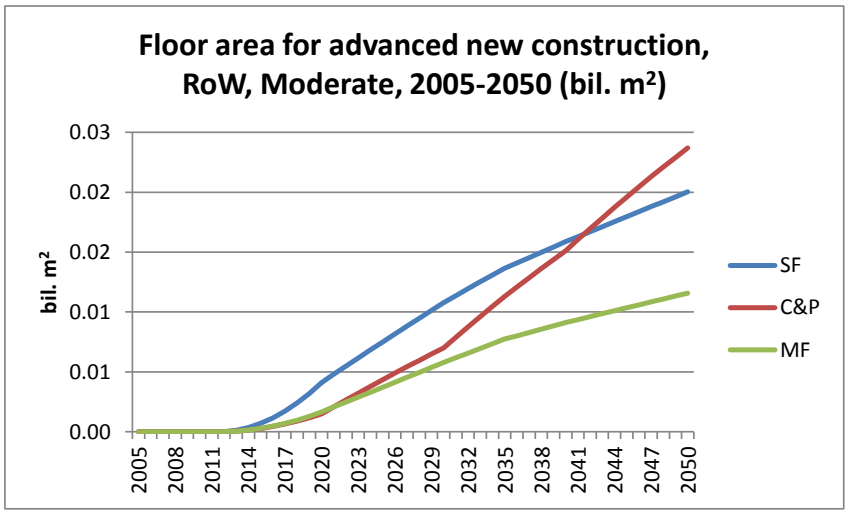


Figure 67 Floor area of advanced retrofit, RoW, Moderate

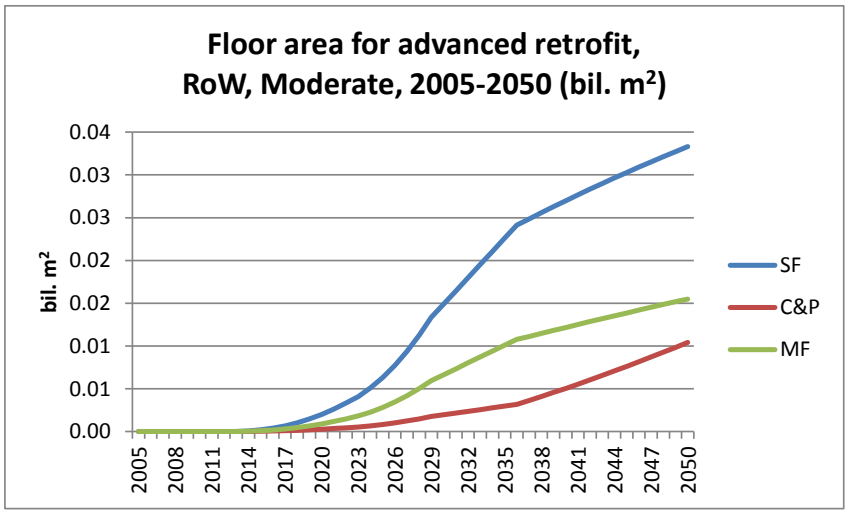


Figure 68 Total floor area, RoW, Moderate

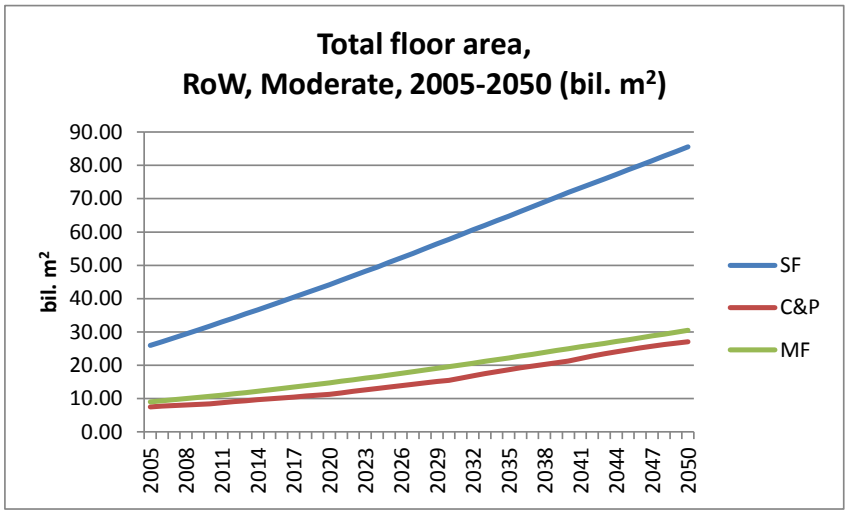


Figure 69 Floor area of advanced new construction, World, Deep

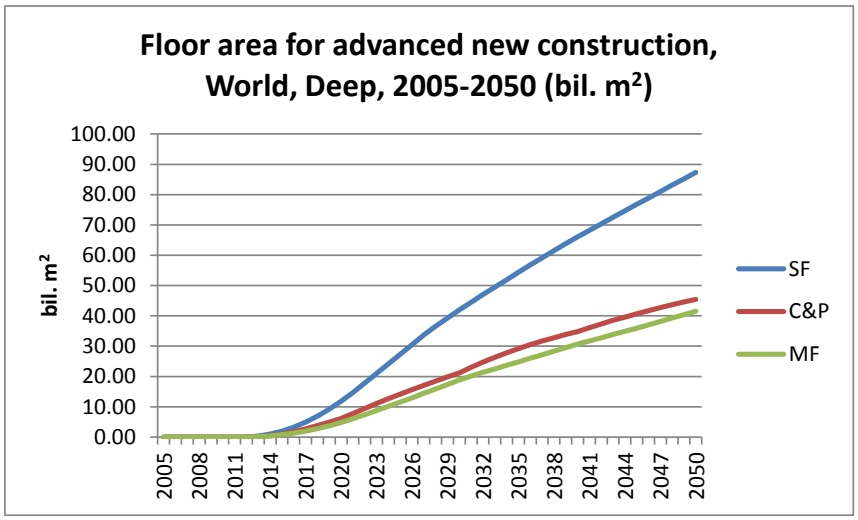


Figure 70 Floor area of advanced retrofit, World, Deep

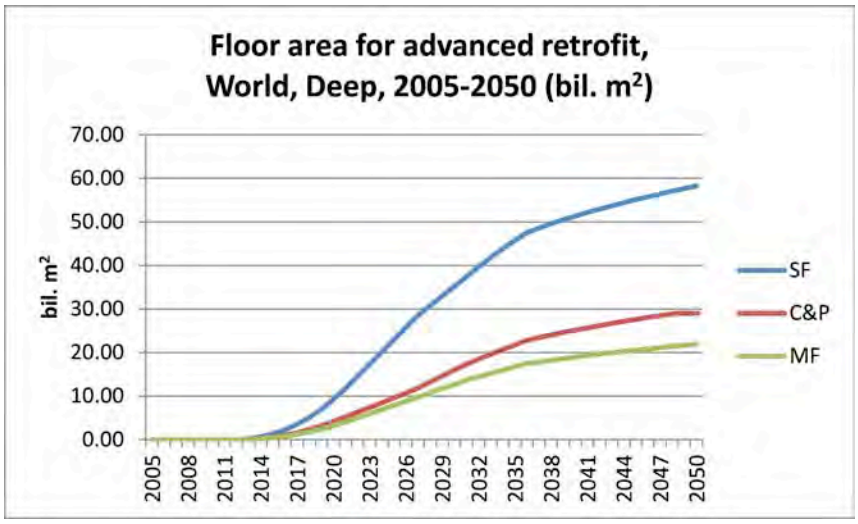


Figure 71 Floor area of advanced new construction, World, Moderate

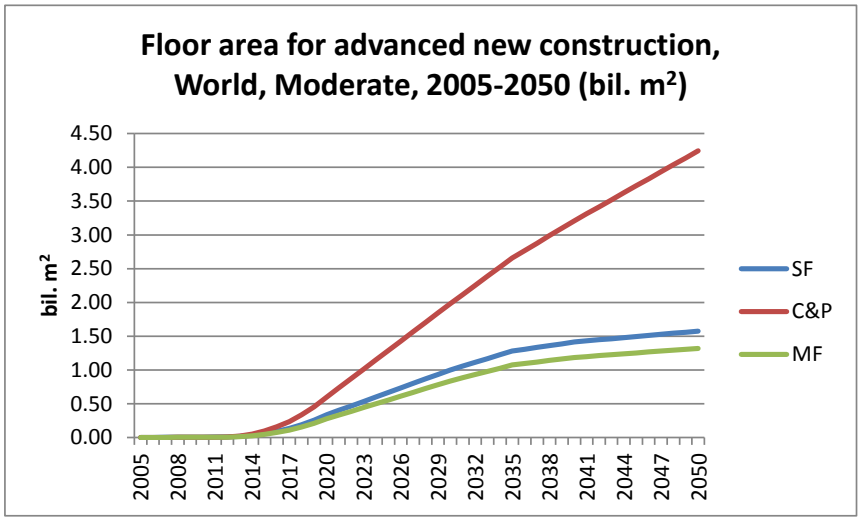


Figure 72 Floor area of advanced retrofit, World, Moderate

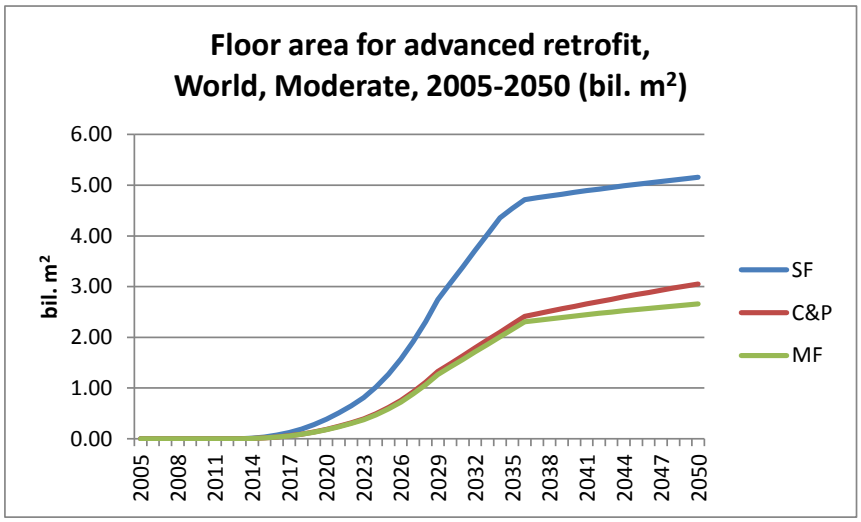
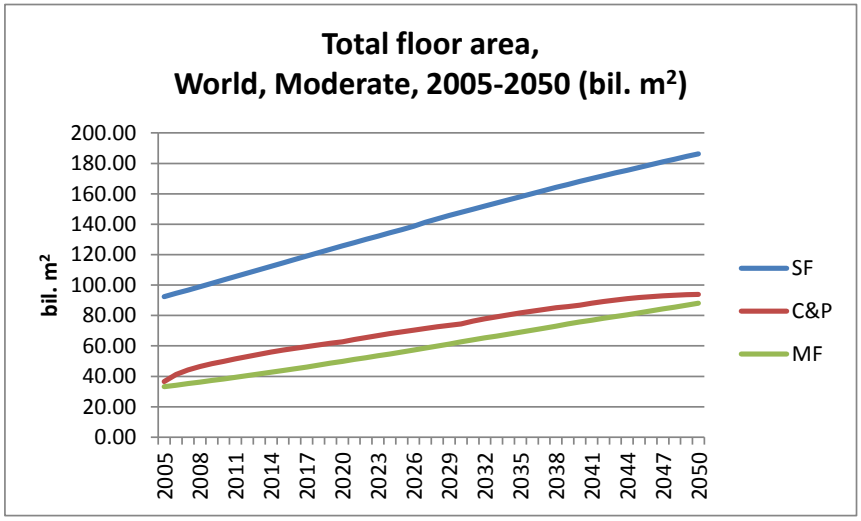


Figure 73 Total floor area, World, Moderate



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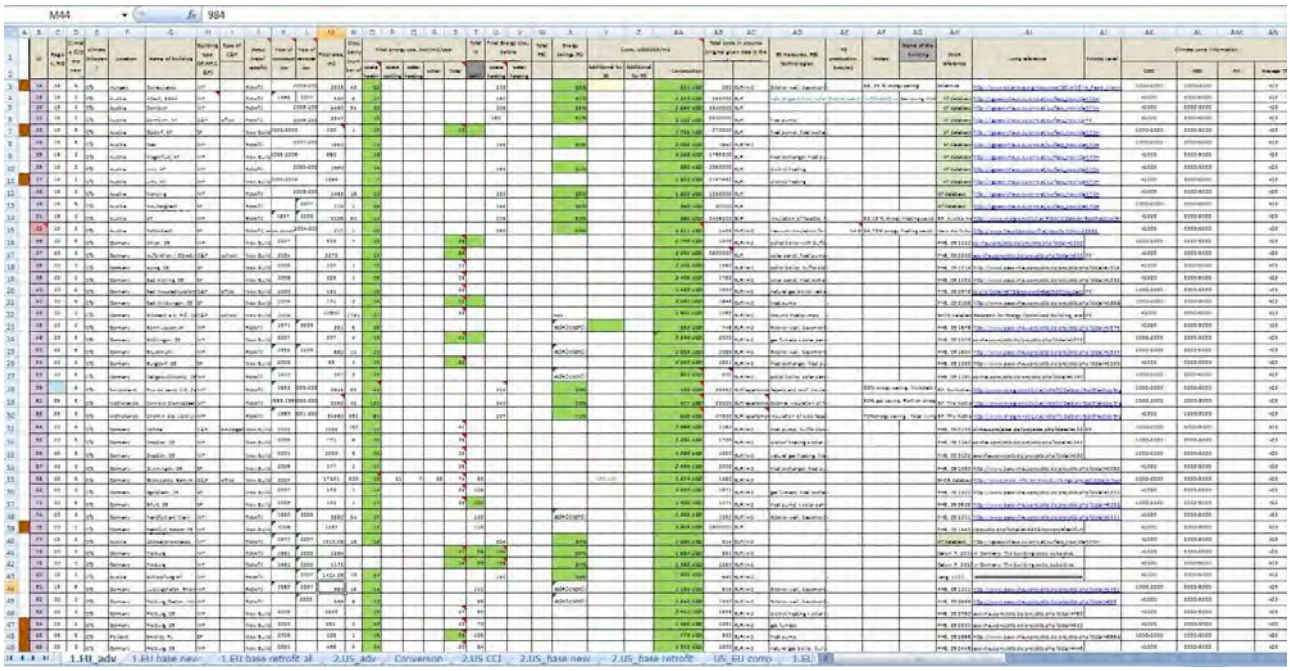
ANNEX 7: EXAMPLE OF THE COST DATABASE

Figure 74 Screen print of the cost database



ANNEX 8: COST RATIO TRANSFER

A8.1 Cost transfer in case of India, C&P buildings' costs

This annex provides an example of the process of collection and selection of cost data for the region, and the process of cost transfer in case of India, a region with limited reliable cost data. For the reason of simplicity, the building type C&P was chosen.

A8.1.1 Collecting case studies

In the process of case study collection, the following case studies have been examined:

- 71 case studies of advanced new constructions and advanced retrofits, different building types among them
  - 12 full reliable case studies
  - 59 patially useful case studies with one missing data
- 91 reliable statistical cost data for different building types and different locations in India (Turner & Townsend, International construction cost survey, 2012). From these sources only the low and medium standard of the building's design and equipment are considered – i. e. the luxury category is excluded.

For every climate zone (especially the major climate zones, i. e. the CIDs with significant share on the total region's population) the following cost data have been searched for:

- N^{LOW}
- N^{BC}
- AN^{70+}
- R^{10}
- R^{30}
- AR^{70+}

In general, for N^{LOW}, N^{BC}, R^{10} and R^{30} statistical data were available (i. e. Turner & Townsend, International construction cost survey, 2012). For AR^{70+} and for AN^{70+} Best practice case studies must have been searched for. Table 87 summarizes the available cost data for India, for the C&P buildings.

87. Table Available cost data for India (case studies and statistical data)

			C&P											
			Frozen				Moderate				Deep			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	1%	vHHD	400				492				492			
2	2%	HHD	400				492				492			
3	0%	MHD / LHD	305				443				443			
8	1%	MHD + LCD	400				492				492			
9	1%	LHD + MCD	400				443				443			
10	1%	LHD + LCD	305				443				443			
11	1%	vHCD	450				525				525			
12	1%	HCD	497				621				621			
13	2%	LCD / MCD	305				443				443			
14	73%	vHCD + DH	450	796		33	525	796	200	33	525	796	200	33
15	16%	HCD + DH	450	539			525	539			525	539		

16	1%	LCD/MCD + DH	405				473				473			

A8.1.2 Evaluation of the collected case studies

After the case studies are collected for the region, all of them are assessed on a case-by-case basis. From the initial number of case studies the case studies with extreme cost values (either too high or too low as compared to the cost data for the given region and vintage) or inadequate energy performance of the given building in the case study were excluded.

As Table 88 shows below, 89 % of the region's population live either in one of the two major climate zones in India: i.e. in CID 14 (73%) or in CID 15 (16%). The identified advanced building case studies were from these two regions as well.

88. Table Evaluation of available data

			C&P											
			Frozen				Moderate				Deep			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	1%	vHHD	400				492				492			
2	2%	HHD	400				492				492			
3	0%	MHD / LHD					443				443			
8	1%	MHD + LCD	400				492				492			
9	1%	LHD + MCD	400				443				443			
10	1%	LHD + LCD					443				443			
11	1%	vHCD	450				525				525			
12	1%	HCD					621				621			
13	2%	LCD / MCD					443				443			
14	73%	vHCD + DH	450	796		33	525	796	200	33	525	796	200	33
15	16%	HCD + DH	450	539			525	539			525	539		
16	1%	LCD/MCD + DH					473				473			

Data available but excluded
Reliable data available
No data available

A8.1.3 Filling out the missing categories and cost ratio transfer

The next step was to fill in the missing data points through an intensified search. Special attention was paid to the data gaps in the major climate zones, due to the fact that those values could influence the final results significantly and also because these identified values are further used as a basis for cost ratio transfer within the region.

Table 89 shows the available reliable data points for C&P based on the different sources (genuine case study, local reviewer, average of several case studies, data from a statistical source).

89. Table The reliable available cost data from different sources

			C&P											
			Frozen				Moderate				Deep			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	1%	vHHD	400				492				492			
2	2%	HHD	400				492				492			
3	0%	MHD / LHD					443				443			
8	1%	MHD + LCD	400				492				492			
9	1%	LHD + MCD	400				443				443			
10	1%	LHD + LCD					443				443			
11	1%	vHCD	450				525				525			
12	1%	HCD					621				621			
13	2%	LCD / MCD					443				443			
14	73%	vHCD + DH	450	796			525	796	200		525	796	200	
15	16%	HCD + DH	450	539			525	539			525	539		
16	1%	LCD/MCD + DH					473				473			

Data from local reviewer
Data from average of more than one reliable case studies
Data from a concrete genuine case study and reviewer
Data from a reliable statistical database

The cost ratio transfer is based on an assumption that the ratio of costs of different vintages are equal for similar climatic conditions and for the same building type (CID 14 – very high cooling demand and dehumidification, CID 15 – high cooling demand and dehumidification):

$$AR^{70+}/R^{30}_{[USA, C\&P, CID15]} = AR^{70+}/R^{30}_{[INDIA, C\&P, CID14]};$$

Based on this assumption, the cost transfer is applied in the following manner:

$$AR^{70+}_{[INDIA, C\&P, CID14]} = R^{30}_{[INDIA, C\&P, CID14]} * (AR^{70+}_{[USA, C\&P, CID15]}/R^{30}_{[USA, C\&P, CID15]})$$

And the result is:

$$AR^{70+}_{[INDIA, C\&P, CID14]} = 200 * 1563 / 1250 = 250$$ (see Table 90)

90. Table Calculation of approximated data for missing categories

			C&P											
			Frozen				Frozen				Frozen			
			New		New		New		New		New		New	
			New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
INDIA														
14		vHCD + DH	450	796			525	796	200	250	525	796	200	
USA														
15		vHCD + DH	1148	1706	938	1563	1242	1706	1250	1563	1242	1706	1250	1563

This transferred specific investment cost (red number) is further applied to the remaining two scenarios (see Table 91).

91. Table Available data and transferred data 1

			C&P											
			Frozen				Moderate				Deep			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	1%	vHHD	400				492				492			
2	2%	HHD	400				492				492			
3	0%	MHD / LHD					443				443			
8	1%	MHD + LCD	400				492				492			
9	1%	LHD + MCD	400				443				443			
10	1%	LHD + LCD					443				443			
11	1%	vHCD	450				525				525			
12	1%	HCD					621				621			
13	2%	LCD / MCD					443				443			
14	73%	vHCD + DH	450	796		250	525	796	200	250	525	796	200	250
15	16%	HCD + DH	450	539			525	539			525	539		
16	1%	LCD/MCD + DH					473				473			

Data from local reviewer
Data from average of more than one reliable case studies
Data from case study and reviewer
Data from a reliable statistical database

250 Data transferred with the use of cost transfer ratio

Where such a direct cost transfer within the same region is not possible, the cost transfer rely on the ratio of costs in India to costs in China in an other building type, given the same vintage. This ratio is based on the most representative climate zone regarding the two regions, CID15.
This means for example, that the cost of C&P in India for CID 10 is calculated based on the cost ratio of the same vintage - AR^{70+} and same climate zone – CID 15 in India and China, applied to the "known" category in India – in this case AR^{70+} for C&P).
$AR^{70+}_{[INDIA, C\&P, CID15]}/AR^{70+}_{[INDIA, SF, CID10]} = AR^{70+}_{[CHINA, C\&P, CID15]}/AR^{70+}_{[CHINA, SF, CID10]}$
In the equation presented above only '$AR^{70+}_{[INDIA, C\&P, CID10]}$' is an unknown.

From which follows:
$AR^{70+}_{[INDIA, C\&P, CID10]} = AR^{70+}_{[USA, C\&P, CID10]} * (AR^{70+}_{[INDIA, SF, CID15]}/AR^{70+}_{[CHINA, SF, CID15]})$
(Where the costs from China came from a reliable cost ratio transfer from the USA similarly as above.)

And the result is:

$AR^{70+}_{[INDIA, C\&P, CID10]} = 225 * (326 / 342) = 214$

With these two method the missing cost data gaps are gradually being filled in (see Table 92).

92. Table Cost transfer in progress

			C&P											
			Frozen				Moderate				Deep			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	1%	vHHD	400	1042	143	238	492	1042	190	238	492	1042	190	238
2	2%	HHD	400	1042	143	238	492	1042	190	238	492	1042	190	238
3	0%	MHD / LHD	305	937	129	214	443	937	171	214	443	937	171	214
8	1%	MHD + LCD	400	1042	143	238	492	1042	190	238	492	1042	190	238
9	1%	LHD + MCD	400	937	129	214	443	937	171	214	443	937	171	214
10	1%	LHD + LCD	305	937	129	214	443	937	171	214	443	937	171	214
11	1%	vHCD	450				525				525			
12	1%	HCD	497		156	260	621		208	260	621		208	260
13	2%	LCD / MCD	305	937	129	214	443	937	171	214	443	937	171	214
14	73%	vHCD + DH	450	796	150	250	525	796	200	250	525	796	200	250
15	16%	HCD + DH	450	539			525	539			525	539		
16	1%	LCD/MCD + DH					473				473			

Data from local reviewer
Data from average of more than one reliable case studies
Data from case study and reviewer
Data from a reliable statistical database

The remaining data gaps, especially for the CID 11, 12, 15 and 16 are being filled in based on the following assumptions:

- CID 11 has very similar climate as CID 14 (very high cooling demand with or without dehumidification) so the investment costs are assumed to be on the same level.
- The advanced new buildings in CID 12 (high cooling demand) are assumed to cost the same as in CID 11 and CID 14 as well, due to the dominance of high cooling demand.
- CID 16 which accounts for only 1 % of the population, is assumed to have 10 % lower investment cost than CID 14, due to milder climate and cheaper equipment (it is assumed that less equipment is required in general and of smaller capacity).

Table 93 shows the resulting table of the transferred cost data from reliable sources, transferred data either based on the cost transfer ratios of differet region, or transferred based on assumptions of the similarities between different climate zones.

93. Table Available reliable data and transferred data

INDIA			C&P											
			Frozen				Moderate				Deep			
			New		Retrofit		New		Retrofit		New		Retrofit	
			New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit	New	Adv. New	Retrofit	Adv. Retrofit
CID	% share	Climate	N^{LOW}	AN^{70+}	R^{10}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}	N^{BC}	AN^{70+}	R^{30}	AR^{70+}
1	1%	vHHD	400	1042	143	238	492	1042	190	238	492	1042	190	238
2	2%	HHD	400	1042	143	238	492	1042	190	238	492	1042	190	238
3	0%	MHD / LHD	305	937	129	214	443	937	171	214	443	937	171	214
8	1%	MHD + LCD	400	1042	143	238	492	1042	190	238	492	1042	190	238
9	1%	LHD + MCD	400	937	129	214	443	937	171	214	443	937	171	214
10	1%	LHD + LCD	305	937	129	214	443	937	171	214	443	937	171	214
11	1%	vHCD	450	796	150	250	525	796	200	250	525	796	200	250
12	1%	HCD	497	796	156	260	621	796	208	260	621	796	208	260
13	2%	LCD / MCD	305	937	129	214	443	937	171	214	443	937	171	214
14	73%	vHCD + DH	450	796	150	250	525	796	200	250	525	796	200	250
15	16%	HCD + DH	450	539	148	247	525	539	197	247	525	539	197	247
16	1%	LCD/MCD + DH	405	716	135	225	473	716	180	225	473	716	180	225

Data from local reviewer
Data from average of more than one reliable case studies
Data from case study and reviewer
Data from a reliable statistical database

A8.1.4 Review from local reviewer

Rajan Rawal, January 2013. Application of suggested values of costs.

A8.1.5 Sensitivity analysis

Considering the uncertainty of most reliable cost data even (due to consideration of taxes, hard and or soft costs, etc.), sensibility analysis has been conducted for different variables including 'specific investment cost' (for details see chapter 10: Sensitivity analysis).

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About GBPN

The Global Buildings Performance Network (GBPN) is a globally organised and regionally focused network whose mission is to advance best-practice policies that can significantly reduce energy consumption and associated CO_2 emissions from buildings.