

Case Study

● Achieving Low Carbon Housing Development - Carbon Emission Estimation

● Partnering Community Education Programme with Green Groups - Our Green Delight in Estates Programme

Achieving Low Carbon Housing Development – Carbon Emission Estimation

Climate change is the most controversial environmental issue nowadays. Managing a massive local housing programme, the Housing Authority strives to explore a diverse range of low carbon initiatives.

It is reported that the construction and occupation of buildings are major contributors of anthropogenic emission of greenhouse gases (GHG). As the largest estate developer in Hong Kong, the HA constructs around 15 000 flats in 20 new residential buildings a year on average. To seek carbon emissions reduction opportunities for housing developments at the planning and design stages, we have taken a step forward to develop a life cycle Carbon Emission Estimation (CEE) method to estimate the carbon dioxide emission from buildings throughout their life cycle.

This methodology applies a Life Cycle Assessment (LCA) framework to estimate the GHG emissions in terms of carbon dioxide equivalent ($\text{CO}_2\text{-e}$) of a public housing block from cradle to grave. This also enables the establishment of the benchmarks of emission level for a housing block and a housing estate throughout the project life cycle stages to facilitate comparison and to set achievable goals for improvements. The estimated result is presented in terms of $\text{CO}_2\text{-e}$ emissions per flat and per metre square of gross floor area (GFA) and construction floor area (CFA) of the building. In principle, the CEE covers the following six major aspects:

Coverage of Carbon Emission Estimation

Aspect	Sources of GHG Emissions	
Construction Stage		
I	Materials Consumed during Construction	i. Steel Formwork for Superstructure
		ii. Timber Formwork for Superstructure
		iii. Steel Formwork for Substructure
		iv. Timber Formwork for Substructure
II	Materials for Structure	i. Steel for Superstructure
		ii. Concrete for Superstructure
		iii. Steel for Substructure
		iv. Concrete for Substructure
Occupation Stage		
III	Electricity Consumption by Communal Building Services	i. Lighting
		ii. Lift
		iii. Security
		iv. Television
		v. Air Conditioning and Ventilation
		vi. Fire Services
		vii. Water Supply
		viii. Electrical Distribution
IV	Carbon Reduction by Renewable Energy Installations	i. Photovoltaic Panel, Wind Turbine, etc.
V	Carbon Absorption by Plants	i. Trees (Taller than five metres)
Demolition Stage		
VI	Demolition	i. Dismantling of Building
		ii. Transportation of Building Debris from Site to Landfill

The CEE is a compilation of inventory for estimating the consumption of resources and emissions caused by or otherwise attributable to a housing block's life cycle. Three main steps are involved in the CEE development:

- Creation of a direct requirements matrix of the input and output data connected to each process in the building's life cycle, including production, operation and end of life;
- Linkage of data for environmental exchanges, i.e. carbon emissions released and resources / energy consumption flow to the direct requirements matrix; and
- Calculation of a cradle to grave inventory using the direct requirements matrix and environmental exchange data.

Under the CEE, the estimated GHG emitted during the life cycle process of a standard New Harmony I block based on the Model Client Brief 2010 has been used to establish the carbon emission benchmarks. Six housing blocks and an external area in Kai Tak Site 1A Phases 1 and 2 (KT1A) were further selected for CEE. The result showed that the emission levels of KT1A housing development per flat and GFA are close to the benchmarks. The KT1A development was then taken as another benchmark at the estate level for the CEE for future public housing development.



New Harmony I Block

With the benchmarks established, the carbon emission level of a new housing block can be compared to determine its positioning in terms of environmental impact. The benchmark can also help improve public communication about carbon emissions and, more importantly, serve as a minimum standard to facilitate carbon mitigation through different design alternatives.

Partnering Community Education Programme with Green Groups – Our Green Delight in Estates Programme

In pursuit of environmental sustainability, we understand that it is not sufficient to work on our own. More importantly, we have to educate and engage our PRH tenants to solicit their wider participation and full support. Managing the huge public housing programme in Hong Kong, we should leverage the expertise and network of various green groups to achieve our goals.

Since 2005, we have been partnering with three green groups to launch a large-scale environmental education programme, “Green Delight in Estates” (GDE), in our PRH estates. The GDE, has been rolled out by phases to cover all our managed PRH estates. It aims to raise environmental awareness among PRH tenants and instill a culture of green living to protect and improve the PRH environment. Under the GDE, a territory-wide campaign with a specific environmental theme will be organised every year with the help of the three green groups, together with further education programmes and community activities in a total of about 30 selected estates.



“Green Delight in Estates” Community Activities



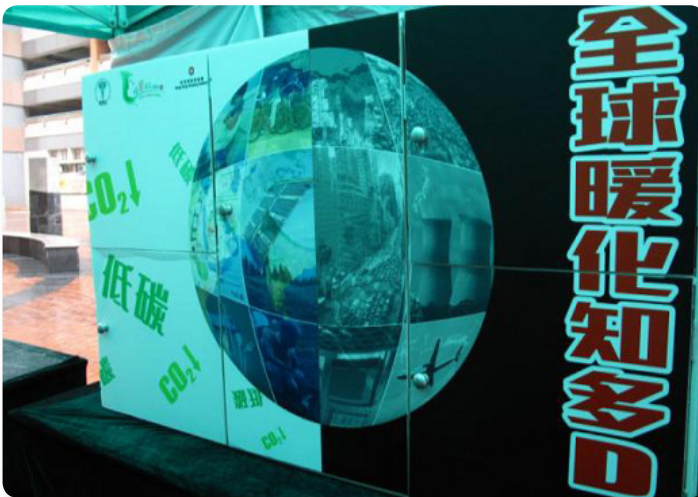
The theme for this year’s programme is “Carbon Reduction in Estates” and the kick-off ceremony of this fifth phase was held on 18 June 2010 at the HA Headquarters. Similar to previous phases, the green groups have worked together with the local estate management offices, EMACs, schools and PRH tenants to provide estate-wide campaigns in relation to the theme of the year.



All Participants Making a Pledge to Reduce Carbon Emissions in Estates at Phase 5 Kick-off Ceremony



Poster Display of "930 Estate Carbon Off Day" at Wang Tau Hom Estate



Educational Game Booth Regarding the "Anti Global Warming Campaign"



The GDE has yielded rewarding results in the past in terms of promoting waste reduction and energy saving, which have been some main themes in previous phases. The survey conducted recently indicated that around 90% of our PRH tenants have developed their habit of bringing their own bags for shopping and above 85% of them have the habits of reducing energy consumption and water consumption. Riding on our past experience, we look forward to a greater success in the GDE programme in the future.