

LIFE CYCLE COST ANALYSIS

Life cycle cost analysis of two major roof types, extensive and intensive, are assessed. The incorporation of energy savings into the life cycle cost analysis provides a better picture of the cost effectiveness of roof gardens. The analysis shows that by factoring the energy savings from the greenery in the extensive rooftop gardens, they cost no more than the conventional flat roof. The initial cost and life cycle cost of inaccessible roofs and accessible roofs with and without rooftop garden are summarized in Table 3.

Tables 3: Summary of Life cycle cost of inaccessible roofs and accessible roofs with and without rooftop garden

3a. Inaccessible roof

Roof type	Initial cost (\$/m ²)	LCC (energy \$)	LCC cost saving	Simple pay back
Exposed roof	49.25	632,948.00	Base case	—
Extensive (100% turfing)	89.86	579,121.00	8.5%	—

The extensive roof on its own could potentially replace the roof insulation layer. Therefore, the cost of extensive roof is compared with the cost of the exposed roof. The results show that there is a 8.5% Life Cycle Cost savings, with a payback period of 10 years. That is, the cost savings will be sufficient to cover initial capital investment in 10 years.

3b. Accessible roof

Roof type	Initial cost (\$/m ²)	LCC (energy \$)	LCC cost saving	Simple pay back
Built-up roof	131.6	670,598.00	Base case	—
Intensive (80% shrubs)	178.9	821,089.00	-22.4%	—
Intensive (50% trees)	197.1	956,404.00	-42.6%	—

On the contrary, for the case of the intensive roof garden in comparison with the built-up roof, the amount of energy cost savings is not sufficient to offset the higher operating and maintenance cost. This study, however, only took into account absolute cost and did not consider other economic and non-monetary benefits of the intensive rooftop gardens, such as the economic value of the conversion of the 'wasted' space into a place for social gathering and individual solace.

The initial cost and life cycle cost of inaccessible roofs and accessible roofs with and without rooftop garden are summarized in Figure 18. It clearly demonstrates that for the case of inaccessible rooftops, the life cycle costs of conventional flat roof exceeds that of extensive green roof after the 10th year