

## RESIDENTIAL FLAT RETROFIT: CHALLENGES OF ACHIEVING SUSTAINABILITY

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### Abstract

**Purpose** - Leasing of residential property is a common investment tool. Landlords usually refurbish their residential properties before offering them in the leasing market. This paper investigates the environmental impact of residential flat retrofit.

**Design/methodology/approach** -The retrofit record of a selected residential building estate in Hong Kong was collected. The impact of the retrofit works was estimated based on structured in-depth interviews.

**Findings** -The retrofit works of residential building estates are small scale, but are frequently carried out, especially prior to a new lease. The works produce various kinds of construction wastes which affect both common and private areas. To achieve a sustainable retrofit, estate property manager, contractors and landlords have to cooperate and work according to a pre-retrofit management plan.

**Research limitations** – An extensive survey should be carried out to confirm the decision making process of retrofit. Different grades of residential property may have different decision making criteria.

**Originality/value** -Although only the residential property was investigated, the results are of valuable references to other property types.

**Keywords:** Residential property, Retrofit, Sustainability

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### 1. Introduction

Retrofit of leased residential flats before a new tenant moving in usually involves the upgrading of the accommodation. There is no works of structural alteration and façade retention in such retrofit works. These retrofit works are usually with two objectives: In common law jurisdiction, there is an implied warranty that a flat is fit for human habitation (Armstrong and LaMaster (1985)). On the other hand, retrofit works are investments which may reduce long-term maintenance costs and attract higher quality tenants. Douglas (2006) proposed a definition for retrofit which is derived from a definition of adaptation: “any work to a building over and above maintenance to change its capacity, function or performance”. It is submitted that small scale retrofit work is rarely considered as having a significant impact on environment or it is assumed to be minimal.

This paper looks at the impacts of retrofits on sustainability. Residential buildings form the substantial proportion of building stock. An objective is to form a retrofit strategy which may reduce the construction waste, or encourage reuse and recycle. Finally, it also reduces the negative impacts of buildings on occupants (Dong et al. (2005)).

## 2. Research Problems

A landlord is required to make repairs and conduct maintenance to keep the rental property in habitable condition. Wall painting, plastering, fixing problem of leakage, drainage blockage, damp, cracks and other defects (if any) are the usual basic retrofit works. Inspection of fire safety system and building envelop are legally required and are usually executed by professionals during retrofit period. Some landlords will change all the locks to a rental property between tenancies. It is also a good time for the landlord to solve the ‘wear and tear’, which means the damage which occurs as a result of ordinary use of the premises by the tenant. There are cases where tenants may be liable for repairing defects which occur as a consequence of the unreasonable wear and tear. For instance, the tenant may not be responsible for repairing windows where the seals have perished if they do nothing to fix the windows, but may be liable to the consequential damages, e.g. damage of the carpet.

Apart from basic retrofit works, landlords may consider the following and do additional retrofit works:

1. Raising Building Value
2. Enhancing Image and Reputation (for corporate landlord)
3. Increasing Overall Sustainability
4. Raising Rental Value
5. Increasing Tenant Retention

It is important to make sure that these are in line with the target level of performance and tenants’ expectation; otherwise there will be a waste of material and time in retrofit (Kelly (2009)). This research investigates the existing extent of residential flat retrofit with a case study and describes the environmental impacts. Before its conclusion, suggestions are made to enhance the sustainability due to the retrofit works.

## 3. Literature Review

Buildings are important to climate change mitigation. United Nations Environment Programme (UNEP) promoted cutting carbon emissions from the building sector as “the cornerstone of every national climate change strategy” with potential benefits ranging from environmental to economic benefits (UNEP SBCI 2009, p. 2). In Australia, energy used in residential buildings is estimated to be responsible for about 12% of the energy consumption (Australian Government Department of Infrastructure and Transport 2013). In Hong Kong, residential buildings consumed about 20% of the total energy produced by electricity and gas (Hong Kong Energy Statistics, Annual Report 2014).

While governments and building owners are demanding for green buildings, they began to look at the impact of building production and improvement process on sustainability. For example, the UK government educates the building owners to make sustainable

purchasing to reduce the impact of the goods and services they buy on the environment (Blundel et al. 2012).

Different scales of building improvement works have their unique operation process. In a large civil engineering project, the government may easily target the owner or project manager to be liable for pollution offences. Small scale retrofit works' operation involves different stakeholders: property owners, occupants, contractors, property management companies and owners' corporation. Retrofit works in private estate affect both private and common areas in the building. The Building and Construction Authority of the Singapore government produced a guideline for retrofit works for existing buildings (The Centre for Sustainable Buildings and Construction, Singapore (2010)). According to the guideline, retrofit works before a new lease have to be analyzed with an objective to achieve sustainability. Nevertheless, the analysis oversimplifies the decision making and operation of retrofit works. It assumes the property owners can make all decision retrofit works without considering the roles of property management and contractors. Obviously, the landlord and tenant's criteria should be taken into account (Ástmarsson (2013)).

#### 4. Methodology

This study examined the retrofit works of the private flats of a large private housing estate from 2010 to 2015 through statistics and qualitative analyses. This study interviewed both the property managers who managed the retrofit works of the estate and a qualified minor works contractor. From the property managers, the information of number of retrofit workers involved and duration of each retrofit works were collected. The interviews with the property managers covered the following:

1. Who are responsible for retrofit and waste management?
2. How is the retrofit waste managed?
3. Any measure of waste reduction, reuse or recycle?
4. How the quantity of waste generated from the project will be measured?
5. What measures have the property management office taken in minimizing the environmental impact in the process of retrofit?

Through the interview with a minor work contractor who has over ten years' experience in retrofit works for private residential flats, the following questions were asked:

1. What types of retrofit waste are usually generated?
2. What have you done regarding the reduction, reuse and recycle of retrofit waste?
3. What are difficulties a retrofit contractor face in minimizing the environmental impact?

With reference to the answers of the above questions, we developed a retrofit process management plan for residential flat prior to new lease to achieve sustainability with the objective of minimize the impact of waste on environment.

## 5. Data Analysis

Hong Kong is a densely populated city. Large private housing estates have been developed since 1968. An estate is a large number of residential building blocks in which residents shared common facilities. One principal deed of mutual covenant (DMC) and resident handbook often govern the entire estate. Residents are required to follow the respective sections in the DMC and handbook when they would like to do retrofit works for their flats. Some common sections regarding retrofit works are listed below:

1. Residents are required to apply to the property management office for executing retrofit works three days before works start.
2. Details about the contractors should be informed to the property management office.
3. A deposit of HK\$3,000 (or AUD 600) should be paid to the management office.
4. Each worker should wear a work permit while working in the estate.

This study has investigated “Vista Paradiso” (Photo 1), a large private housing estate in the suburban area of Hong Kong. It is near a train station of Ma On Shan Line and in the neighborhood of two universities. The estate was completed in 1998 and consists of 11 residential towers, with floors of 29 to 37. There are a total of 2,032 flats. Near 30% of the flats are occupied by tenants.

During the years from 2010 to 2015, there were about 750 retrofit works each year. According to the data from the property management office, most of the retrofit works are carried by one worker only. Very few retrofit works hired tenor workers. Most retrofit projects finished in 2 months or less.

According to the estate property manager, the contractor, property owner and occupant are responsible for retrofit and waste management. The property management office's policy of retrofit waste management aims to minimize the nuisance to other occupants. There are no measures of waste reduction, reuse or recycle. No measurement or estimation regarding the quantity of waste generated from the retrofit works. The estate property management office takes no measures in minimizing the environmental impact in the process of retrofit. The property managers are concerned more about health, safety and security than long term environmental impact. Lastly, it is noted that the duration of most leases of residential flats is two years. That explains the high frequency and small scale of retrofit.

Through another in-depth interview, a minor work contractor who has over ten years' experience in retrofit works for residential flats expressed the following opinions:

- Subject to the scale of retrofit works, much waste is resulted from demolition. Bricks, wood, concrete, tiles, ceramics, glass, mixed metals, cable, gypsum and plastic are the common waste of retrofit works, as illustrated in Photo 2. Most of them are mixed and transported to the landfill directly without any process of sorting, reduction in size, recycling, and reuse.
- Due to the constraints of time, cost and space, he cannot do any additional works on reduction, reuse and recycle of retrofit waste.





Photo 1: Vista Paradiso



### Photo 2: Wastes of Retrofit Works

Based on the above information, the following observations are made:

1. There are constantly a lot of small-scale retrofit works in large private residential estate.
2. A plan is necessary to provide a structure for retrofit work, waste delivery and disposal at all stages (Tam (2008)). Such a plan should identify the following:
  - Who will be responsible for retrofit management in different areas and during various stages, i.e. private and common areas within the estate?
  - What types and quantity of retrofit waste are to be generated?
  - How the waste is to be managed? Will they be reduced, reused or recycled?
  - Which contractors are to be appointed to ensure the waste is correctly recycled or disposed of?
  - How the quantity of waste generated from the work will be measured?

With reference to the Guide to Site Waste Management Plans of Northern Ireland Environment Agency (2015), a pre-retrofit waste management plan is developed for residential flats to achieve sustainability and is illustrated in Figure 1.

Before retrofit starts, the property owner and contractor should submit a retrofit waste management plan to the property management office. The purpose of the plan is to minimize the environmental impact due to the retrofit activities. The owner and contractor named in this document shall take all reasonable steps to ensure all waste from the site to be dealt with according to the DMC and resident handbook; and retrofit materials are handled efficiently and waste managed appropriately.

Owners and contractors should identify the waste regarding their types and quantity. They should inform the property management office of the size of waste and other details like whether they need special treatment, e.g. asbestos. Property management office should assist contractors in waste reduction, recycle and reuse. For example, contractors may need spare space for waste sorting and temporary storage. A complete plan of waste handling should involve owners as well due to additional cost incurred. Owners' corporation which decides the use of common area in the estate may also join in the planning of waste handling. Training and communication networks are provided to the staff of contractors and property management office. The amount of waste with different use should be measured according to respective criteria: volume, value and weight. Owners, property manager and contractor should meet periodically to monitor the works. After the work is completed, contractors should review and provide a report to the management office and owners.

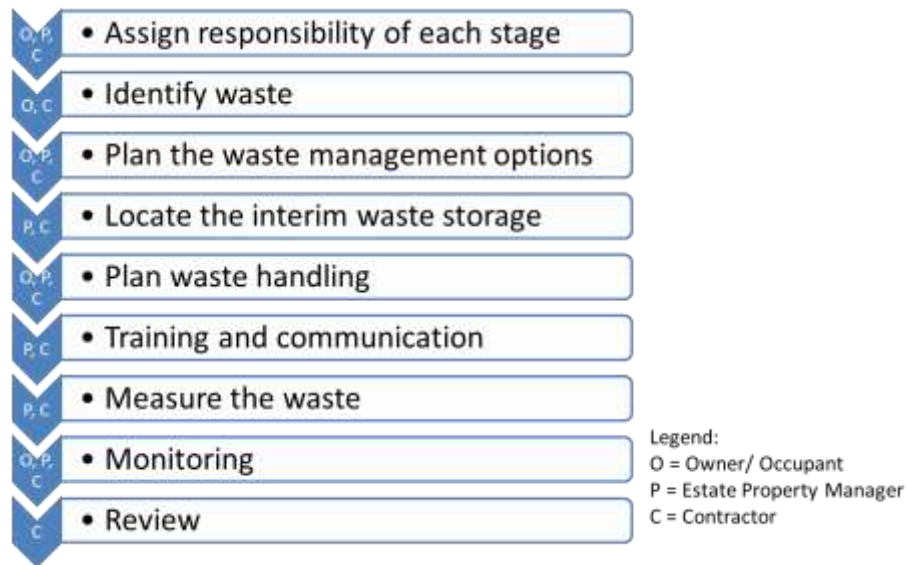


Figure 1: A Pre-retrofit Waste Management Plan

## 6. Further Research

A limitation of this research is the inadequacy of residential retrofit data, e.g. the amount and types of construction and demolition waste produced during different phases of a project. An extensive survey should be carried out. It should be noted that different grades of residential property may have different wastes profile.

To review the pre-retrofit management plan, the existing scenario of current retrofitting practice and the scenario under the pre-retrofit management plan should be compared. It is submitted that the carbon footprint calculation is a good tool for the comparison (Lai (2014)), as illustrated in Figure 2.

Through the comparison, the study team can assess the pre-retrofit management plan in treating with construction and demolition waste. The comparison will also involve the facility management practice which covers both maintenance and operation efficiency (Wong (2007); Wong (2013)).

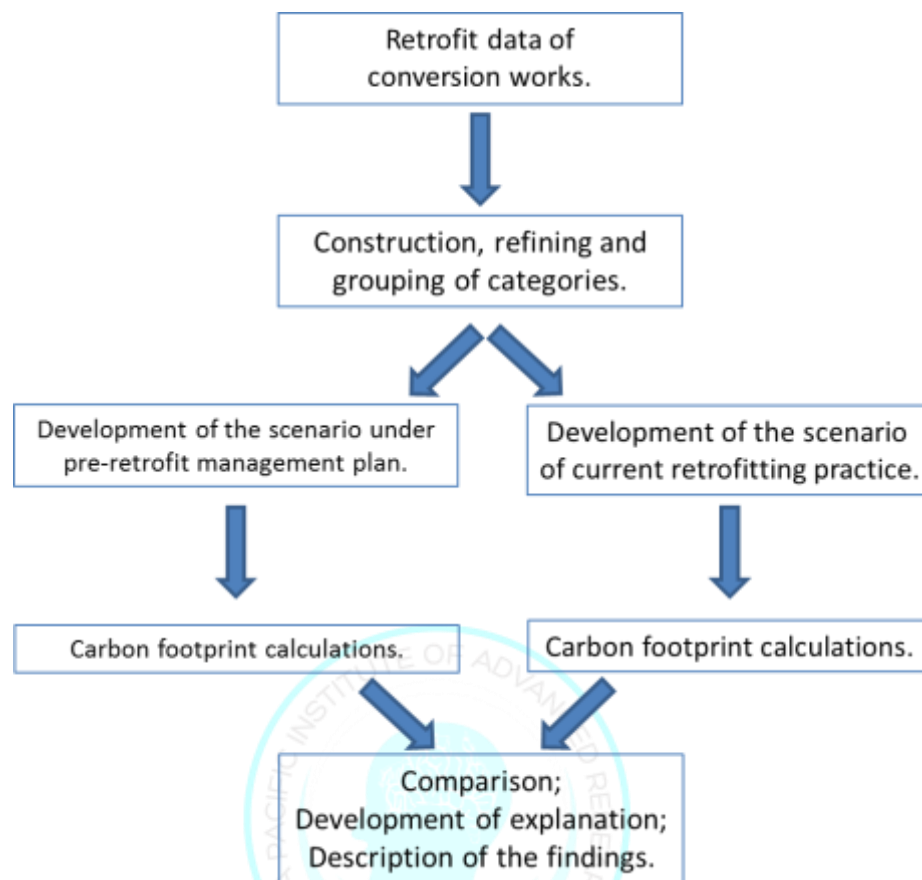


Figure 2. The Further Research Plan

### Conclusion

The increasing awareness of sustainability from large-scale construction works has recently extended to retrofit works. The UK government started the implementation of a site waste management plan (SWMP) method to construction works in 2008. With reference to the SWMP, this paper proposed a pre-retrofit waste management plan for residential flats in large estate. According to the data collected from a large residential estate and two structured in-depth interviews with the property manager and contractors, it is submitted that the environmental impact due to the small scale but frequent retrofit works are serious. To achieve sustainable retrofit, it calls for a better cooperation among landlords, estate property managers and contractors.



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