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Viable urban redevelopments – exchanging equity for energy efficiency

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Abstract

This research paper examines the potential of urban refurbishment projects to accommodate ambitious low-energy solutions. This can be made possible by aligning the interests of the community (energy conservation) and owner (increased value) through redeveloping the land owned by present residents being used as equity to finance the low-energy upgrades to existing dwellings. This holistic view of urban redevelopment is presented as a financial analysis model. In the paper a real-life case of the Siltamäki suburb in Helsinki, Finland, is presented and analysed. The approach used to interpret the case is the Public-Private-People Partnership (4P). It was found that the developed model allows several different scenarios to be presented for decision-making

without compromising any of the stakeholder's financial interests and, that owner-occupiers can, as a result, have new energy efficient refurbishment options. The originality of this paper lies in the way the owner-occupiers' viewpoint is included in a refurbishment and redevelopment process.

Keywords

Energy efficiency

Low-energy refurbishment

Urban redevelopment

Public-Private-People Partnership

Financial analysis model

Refurbishment options

1. Introduction

Present building stock is, in developed countries, responsible of 30-40 per cent of energy use carbon emissions (UNEP, 2007). Therefore, existing dwellings are of paramount importance when it comes to fighting climate change. Some reckless calculations even present, already, the amount of dwellings to be demolished, if the GHG (greenhouse gas) emission targets are to be achieved, but refurbishments do dominate the field (Power, 2008).

A huge challenge in Europe lies in renovating the energy hungry neighbourhoods constructed post Second World War. Especially, in the Nordic countries these suburban homes represent a large portion of the housing stock, which now faces extensive refurbishments due to aging component assets. In Finland alone, some 570,000 apartments are now facing such refurbishments, including, for example, facade and plumbing renovations. This means that, during the next two decades, the annual number of renovated suburban apartments is bigger than the number of new-built apartments that construction industry products annually (Salminen, 2009).

The pressing need to refurbish neighbourhoods constructed in the 1960's and 1970's is a question of social, environmental and economical sustainability. Social, because people residing in these neighbourhoods are aging and require more and different kinds of services. On the other hand, the services are dearer to produce when housing density decreases as the function of both time and accumulating personal affluence. It is environmentally vital, because roughly a third of greenhouse gas emissions per capita is directly related to housing (Seppälä, 2009; Heinonen et al, 2010). Refurbishment enables low-energy retrofitting in the existing housing (Atkinson et al, 2009; Lahti, 2010), if it only can be afforded. The Finnish Ministry of Environment has therefore launched a program for subsidising renovations aimed at improving energy efficiency. Somewhat similar initiatives exist elsewhere, for example, in Germany (Kuckshinrichs et al, 2010). And finally, the need for refurbishment is an economical question, because housing also forms a major part of both national and personal wealth. In addition, changes in quality and location of housing in Finland affect property taxes and levies collected by public authorities.

As can be seen above, the dimensions of sustainability also overlap in urban redevelopment and energy efficiency is not the only, nor always a shared, goal. Such overlaps create tensions and even conflicts between the different sustainability targets (Godschalk, 2004). Optimally the neighbourhoods are refurbished so that none of these dimensions of sustainability nor the parties will suffer, otherwise some of the parties will not have an incentive to do any but the most necessary renovations. Deficiencies in the traditional, sequential urban planning process in coping with this major refurbishment challenge are becoming more and more evident, and finding new ways to improve the dialogue between all the actors for low-energy urban refurbishment is crucial (Kuronen et al, 2010; Edelman, 2007).

One specific reason for the refurbishment, let alone redevelopment, process being so complex is the number of stakeholders present. In Finland these include at least homeowners, tenants, housing companies and associations, central and local government, developers, banks, institutional and private investors, companies and registered associations practicing in the area. Another reason, typical for owner-occupied housing, making the refurbishment and redevelopment difficult, is that the people, who already own their apartments and the land underneath, may be reluctant to take loans, potentially on top of their existing ones, to finance refurbishment.

Approximately 60 per cent of Finnish homes are owner-occupied. Of house types 60 per cent of stock is in block of flats or terraced houses (Statistics Finland, 2008). Finnish housing companies are, basically, a management system applied somewhat similarly to condominiums or owners' associations and used in owner-occupied blocks and terraced houses. Similarities to other Nordic models do exist (Lindgren & Castell, 2008). Home-owners are shareholders in housing companies entitling them to control their own house or apartment and obligating them to share the costs of management. Housing companies are limited liability, non-profit organizations not allowed to take risk by law. Their only purpose is to own one or more buildings in which more than a half of the total floor space of the buildings is specified as residential apartments in the possession of shareholders (Government of Finland, 2009). They are legal entities like other limited liability companies.

In this study, the situation that prevails in Finland is discussed, but the overall idea of using current land ownership of the inhabitants with redevelopment potential to create opportunities for equity markets is a concept considered to be applicable internationally.

The purpose of this study is to

- Show how energy efficient refurbishments could be partly financed by using external investments in building rights, and
- How the local government possessing the planning monopoly could set the scene for energy efficient refurbishments.

A financial model of viable urban redevelopments in these multi-stakeholder environments is presented and used to answer the following research question and latter sub-question:

- How can the current land ownership of housing companies be used as a vehicle for low-energy refurbishment of existing suburbs?
- How could a 4P (Public-Private-People Partnership) improve this refurbishment process towards producing an assortment of more economical and energy efficient refurbishment options?

As a framework for multi-stakeholder environment the 4P approach is used. Here the People are the inhabitants of an existing neighbourhood, represented by their housing companies. This representativeness eases negotiations within partnership.

This study relies on the proposition that more interaction between stakeholders could lead to more choices in refurbishment options and financing them, and that the traditional planning process does not enable such interaction. The study presents a financial analysis model, which tries to maximise the value of redevelopment to the owner-occupiers and public stakeholders of an existing neighbourhood. The viewpoint of the model is that of People's, particularly, that of a single owner-occupier making decisions within a housing company. Furthermore, the study tries to recognise the multi-stakeholder environment of urban redevelopment and develops a new urban redevelopment framework based on holistic redevelopment thinking and the external investor's interest.

First, this paper presents the methodology used; second the urban redevelopment concept in 4P framework is introduced and developed onto the financial analysis model, which is then applied to the real life case of Siltamäki, an existing owner-occupied suburb in Helsinki. Finally, answers to the research questions above are provided and some conclusions drawn. The principal finding in this research paper is that within 4P, the inhabitants have new possibilities to finance energy efficient, or low-energy, refurbishment.

2. Methodology

The study uses mixed methods research with an emphasis on quantitative research (financial analysis). The required data was collected from various sources. Existing data such as published reports, zoning plans, statistics, demographic studies and newspaper articles were used.

Moreover, thematic interviews of key participants and relevant stakeholders representing all three parties (Public, Private and People) were conducted and workshops of the Siltamäki project group were observed. The multi-professional project group was formed because Siltamäki is a case of a large research program. To allow emerging ideas to stand out, mostly open-ended questions were used in the interviews, which were semi-structured.

The financial analysis model created in this study includes the potential for housing companies to raise money (equity financing), also indicating costs due to releasing this potential, and costs of low-energy refurbishments compared to conventional refurbishments. These are evaluated from a single owner-occupier's viewpoint. For simplicity the building right is considered as the only income variable in the financial analysis model. The model was sketched in the workshop based on the data, developed more thoroughly later and re-evaluated with participants so that the most relevant factors are present.

By using the financial analysis model the interests of the most important stakeholders in suburban redevelopment are being integrated. With the model the effects of an investment opportunity can be estimated and different scenarios created and evaluated. It can be determined which variables are important to each stakeholder, which variables are those that can be most easily affected and who has the power to do so.

Originally, the model was developed and pre-tested at workshop meetings with the Siltamäki project group, where the model was presented, discussed, and approved. It was acknowledged in the workshops that scenarios represent a new approach for the Finnish markets and the closest resemblance could be found perhaps in neighbourhood development projects in Australia and North America. However, workshop meetings concluded that new approaches are crucial to untangle the low-energy refurbishment challenge of Siltamäki.

3. Public-Private-People Partnerships in redevelopment

Developments, both creating new and altering old buildings, are multi-stakeholder environments (Healey, 1998; Rydin, 2010). Recent research has introduced the concept of Public-Private-People Partnerships (4P's) into field of urban development (Kuronen et al, 2010; Majamaa, 2008). All stakeholders mentioned in the Introduction fall into one of these categories of Public, Private or People¹ (Table 1).

¹ Capitalised forms are used for greater clarity when referring to the stakeholder categories.

<i>Category</i>	<i>Public</i>	<i>Private</i>	<i>People</i>
<i>Stakeholders</i>	Local government (Municipality)	Developers Banks	Homeowners (organised in housing companies)
	Central government (State)	Institutional investors Private investors Construction companies	Tenants Registered associations

Table 1. Categories and stakeholders in 4P urban development.

The usage of PPP (Public-Private Partnership) as a term in redevelopment processes, where potential for land value development has a key role, has been termed leverage planning in the UK and it has been used also in the Nordic urban development context (Brindley et al, 1989; Mäntysalo, 1999). This means that the Public party agrees on negotiating the planning regime and provides incentives for other parties to achieve its own policies. However, leverage planning does not include People as 4P does.

Although it is hard to demonstrate in a watertight way the contribution of partnership models in successful urban redevelopment project, it is the view shared by many contemporary researchers (Ball, 2004; Ball & Maginn, 2005; Rudlin & Falk, 2009). Effective partnerships are nevertheless to be inclusive and egalitarian (Hastings, 1996) and that's where 4P aims. Urban development and redevelopment have been studied in great rigour and the need for process changes has been recognized by several studies, which include Väyrynen (2010), Kuronen et al (2010), Doak & Karadimitriou (2007) and Edelman (2007).

The status of the People has been discussed earlier, though in different contexts. A prominent approach to People is the idea of neighbourhood as a club or a firm that as an institution governs the production and consumption of urban space (Webster, 2003). In redevelopment Webster defined three levels of neighbourhood, relevant to this study also: the micro-neighbourhood (adjacent homes that is, a housing company), meso-neighbourhood (street) and macro-neighbourhood (common services). Usually the People in neighbourhoods are just listed under community participation, as a form of consumer participation, as negotiators for different compensations, or as a herd for so-called 'community leaders' to guide (Ball & Maginn, 2005). However, a distinction must be made according to housing markets. Ball (2004) has discussed the divergences in views in urban regeneration when the pay-offs vary or when the community does

not equal the beneficiaries of project outputs. Owner-occupancy at least partially tackles this issue.

A suburban redevelopment project has an opportunity for equity financing, rather than solely relying on the debt financing in financial arrangements. The possibilities of equity financing vary case-by-case and, for external investors' rational decisions to intercept with local development conditions, new innovations are crucial (Joutsiniemi, 2010; Staffans et al, 2009; Ahlava & Edelman, 2008; Guy & Rowley, 2002; Healey, 1998). The government's (Public's) crucial role concerning all kinds of property development and construction is brought out by also Urbanavičienė et al (2009). The investor decision-making has been discussed, for example, by Ranaweera and Crawford (2010), and Wilmot and Crawford (2008).

The difference between equity financing and debt financing is important to keep in mind. In the traditional debt financing (see Figure 1), a housing company borrows money for the refurbishment. In return, the lender receives interest payments on the outstanding principal, until the whole principal has been paid off. To safeguard its investment, the lender keeps enough of the borrower's property as collateral. After the lender has received the whole principal, it does not retain any ownership rights.

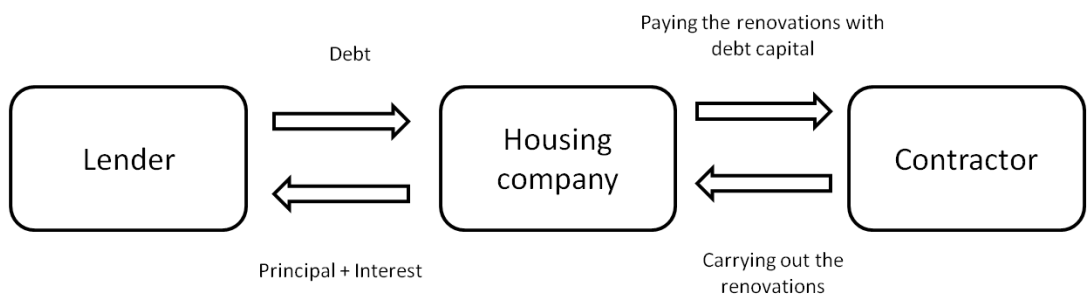


Figure 1. Traditional debt financing. (After Luoma-Halkola et al (2010))

In the equity financing (see Figure 2), a housing company sells or rents its property to an external investor in order to raise additional capital for financing the refurbishment. This external investor retains an ownership right and requires a certain level of yield in order to embark on the

investment. The risk is always higher for equity investment than for debt investment, because debt is paid off first and there is such strong collateral backing it up. For the equity, there is no guarantee about the cash flows, thus the amount of uncertainty is higher. This has an effect on investor or developer joining the partnership.

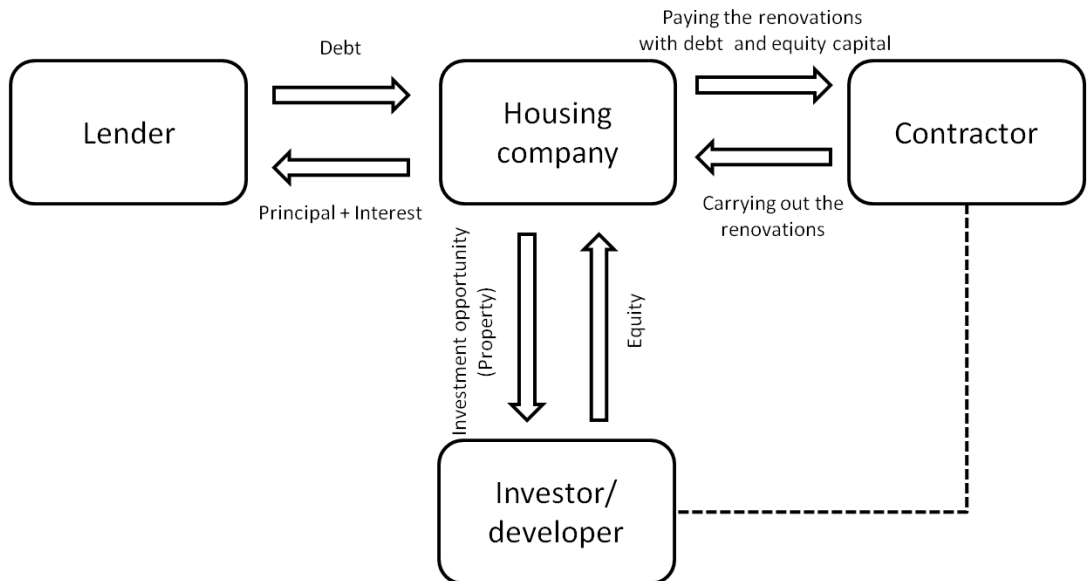


Figure 2. Debt and equity financing. (After Luoma-Halkola et al (2010))

Involvement of external investors could bring the needed relief and additional money for the struggling housing companies (Guy & Rowley, 2002). The large scale of these redevelopment actions most likely requires big institutional investors, such as banks, investment banks or big construction companies who have the resources to design, deliver and finance large-scale suburban redevelopment. As indicated with the dashed line in Figure 2, the developer and constructor can actually be the same company. In the 4P system these all belong to the Private category.

A market-based external investor needs certain business incentives in order to join the redevelopment process as an investor or developer (Rydin, 2010; Guy & Rowley, 2002; Healey & Nabarro, 1990). The most basic principle is that the business has to be profitable. Therefore, what

are the requirements and what is the framework within which it would be feasible for these investors to join the redevelopment investment process? This issue will be discussed later when the financial analysis model is presented. The model can be used for an indicative estimate of the investment's overall feasibility.

4. Case Siltamäki

The 22-hectare area of Siltamäki was chosen as a case study for this project. Siltamäki represents a 1970's neighbourhood fairly well; it even has planning controls to preserve the external appearance because of its value as a representative suburb of the era (Salastie, 2009). Siltamäki has been investigated under a joint venture R&D program - the Agile Renovation Project (*Ketterä korjausmalli*) so much information about renovation prices and the like was already available and the project workshops could be used to evaluate the financial model created in this study.

The location is 15 kilometres north from the central business district of City of Helsinki. The area consists of seven privately owned housing companies, which encompass approximately 1,000 apartments in 44 two or three-storey apartment buildings, total net floor area being 65,500 m² (Salastie, 2009). The refurbishment costs in Siltamäki were estimated to be € 60m. These extensive renovations include facade and balcony renovations, plumbing repairs, and renewal of the electricity and HVAC systems.

Also characteristic of the case is the role of local government. In Finland local governments, City of Helsinki in the case, is in charge of approving land use plans and building permits. Detailed plans must fit the general plan and building permits the national Building code. These assumptions are embedded in the model.

Table 2 below includes the estimated refurbishment costs for Siltamäki, as well as the subsidies offered by the state. Subsidies are offered for renovations, which are considered to have the best potential for energy savings. In Siltamäki these include facade renovations and ventilation system renewal (Lantto & Saari, 2010).

Conventional facade renovations and ventilation system renewals presented in Table 2 would improve the energy efficiency, but real low-energy refurbishment would be more expensive and difficult to justify for the housing companies. Old suburbs have a huge energy saving potential, but to unleash this potential, the incentives for low-energy refurbishment have to be strong. Just by a typical building envelope refurbishment (adding insulation, changing windows and doors) and renewing ventilation, all typical procedures in renovating a house built in the 1970's, the energy consumption can be cut by almost half (Lahti, 2010; Shiel, 2009).

	<i>Renovation costs/m² as per Building Code 2010</i>	<i>Renovation costs/m², low-energy option</i>	<i>Subsidy percentage</i>	<i>Subsidy/m²</i>	<i>Subsidy/m², low-energy option</i>	<i>Price/m²</i>	<i>Price, low-energy option/m²</i>
<u>Facade renovation</u>							
Outer wall renovation	€ 144	€ 185	15 %	€ 21.6	€ 27.8	€ 122.4	€ 157.3
Window renovation	€ 217	€ 240	15 %	€ 32.6	€ 36.0	€ 184.5	€ 204.0
Roof renovation	€ 54	N/A	15 %	€ 8.1	N/A	€ 45.9	N/A
Balcony repair	€ 107	N/A	0 %	€ 0.0	N/A	€ 107.0	N/A
<u>Other necessary renovation</u>							
Plumbing repair	€ 308	N/A	0 %	€ 0.0	N/A	€ 308.0	N/A
Electricity system	€ 58	N/A	0 %	€ 0.0	N/A	€ 58.0	N/A
Air outlet machinery	€ 13	N/A	15 %	€ 2.0	N/A	€ 11.1	N/A
Total	€ 901	€ 965		€ 64.2	€ 73.8	€ 836.8	€ 891.2

Table 2. Estimated refurbishment costs in Siltamäki (After: (Lantto & Saari, 2010; Lahti, 2010)). Options with best value low-energy option available are shown. Where a low-energy option is not available, costs of an option fulfilling the Building Code 2010 requirements are used.

The seven housing companies are joint owners of Siltamäen Huolto Ltd, which manages all of them and the associated land parcels dedicated to parking. Some of these parcels are potential infill development sites.

5. Presentation of the financial analysis model in the 4P environment

The following section briefly describes each stakeholder and their relation to the financial analysis model described in the Methodology chapter above.

People, the shareholders of housing companies, have a key role because they will make decisions about the refurbishment and this is the basis for all the redevelopment. Via the housing companies People also own the land parcels beneath their homes. In the financial analysis model the shareholders' financial burden can be calculated and then be weighed against benefits that the potential investment would bring.

The housing companies' overall position can be determined based on their shareholders. If there is an interest for equity financing, it is necessary to make an inventory of the property that could be used for this purpose. According to the results of the interviews there are three types of property that can be used for investment purposes in Siltamäki. First, land owned but not needed by the housing companies could be sold for infill development purposes. Second, the housing companies could sell building rights for extending their current buildings; however this is not possible in Siltamäki because of preservation restrictions. The third investment opportunity is a sale-and-leaseback of the plots. These are discussed in more detail in the improved framework section. The financial analysis model tries to give a realistic view of how the housing companies' property could bring added value for it.

Public, especially the local government, has a key role in determining if the refurbishment or redevelopment is feasible for other stakeholders. The financial analysis model tries to determine the net position of local government after the direct and indirect costs/benefits it faces are calculated. According to the net position, it can be examined if the local government would be able to make the project more feasible for all parties without hurting its own position either as an authority or as an economically responsible unit. Though the local government approves the plan and collects the development fee (this established term is used in this paper, whereas the term impact fee is widely used in US (Brueckner, 1997)), the state pays for the subsidies of energy efficient refurbishment.

Private is the party that will finance and execute the refurbishment. It can also act as an investor, for example by buying land from the housing company and developing it. These developers have their requirements for the potential investments in infill development. The financial analysis model tries to identify these requirements and to see the project from the developer-constructor's perspective. Each neighbourhood is a unique investment opportunity and has to be

assessed individually. All investors have their incentives and requirements concerning the suburban redevelopment, and as was observed during the study, the issue is multidimensional and further development of the framework is needed in order to fully appreciate this environment.

6. Results

The model examined four scenarios: Base Case, Scenarios 1 and 1' (where some unused land is sold), Scenario 2 (where both all unused land as well as existing plots are sold and leased back) and Scenario 3 (demolishing all existing buildings and constructing new ones).

The building right is the equity potential in the redevelopment. In all scenarios a common thread found is that effective use of permitted building rights is possible only by including in the analysis whole areas at a time, instead of single housing companies. Thus total building right can be treated as one entity instead of several plots.

Thematic interviews were conducted in April 2010. The interviewees included people representing all three parties. All the interviewees saw the decision-making process in housing companies as one of the main problems facing large-scale suburban redevelopment. The communication, planning, designing etc. are very laborious compared to the new construction production. All the interviewees also agreed on the crucial role of the local authority in determining whether the investment is feasible for other stakeholders. The local authority has the zoning monopoly and poses other restrictions and norms that can significantly hinder the investment opportunities.

The development of suburban neighbourhood refurbishment processes and concepts is very current in the construction industry and the possibility of new opportunities is being investigated. These opportunities naturally include extensive refurbishments, but also the potential infill development. Cost savings from economies of scale could be one of the motivating factors for owner-occupiers, as well as for big construction companies.

Real estate funds see the suburban redevelopment as an interesting business opportunity. It is in their interest to be a part of the redevelopment process to make sure that the area will appreciate

in value, because most of the income is derived at the point of sale. The main emphasis to date is on new-built apartment buildings.

The financial analysis model

Table 3 provides three different scenarios for equity opportunities: Base Case and Scenarios 1 and 1' concerned with using the land not currently used for housing purposes that the housing companies own in Siltamäki. These are the most relevant scenarios. In addition, two scenarios with different basis are presented for comparison. Scenario 2 utilises sale-and-leaseback of plots, which is explained above. In Scenario 3, the present buildings are demolished and new ones built; the net income describes the situation where housing companies will face new-built construction costs instead of refurbishment costs.

	<i>Base Case</i>	<i>Scenario 1</i>	<i>Scenario 1'</i>	<i>Scenario 2</i>	<i>Scenario 3</i>
Price of building right (/m ²)	€ 500	€ 500	€ 500	€ 500	€ 600
Sellable building right (m ²)	11,500	32,000	32,000	78,400	66,500
(=) Market price for building right	€ 5,750,000	€ 16,000,000	€ 16,000,000	€ 39,200,000	€ 39,900,000
(-) Replacing garages (demolition costs in Scenario 3)	€ 500,000	€ 1,390,000	€ 1,390,000	N/A	€ 6,425,050
(-) Replacing open parking space	€ 2,750,000	€ 7,650,000	€ 7,650,000	N/A	N/A
(=) Income before development fees	€ 2,385,000	€ 6,640,000	€ 6,640,000	€ 39,200,000	€ 33,474,950
(-) Development fee	€ 539,014	€ 1,911,000	€ 539,014	N/A	N/A
(-) Zoning costs	€ 115,000	€ 320,000	€ 320,000	N/A	N/A
(=) Net income	€ 1,845,986	€ 4,729,000	€ 5,780,986	€ 39,200,000	€ 33,474,950
(new-built costs of € 154,201,200 will be subtracted from Scenario 3.)					

Table 3. Equity option scenarios.

Base Case scenario

Base Case is a rather realistic scenario. The sellable area in the Base Case is presented in the southern (lower) part of Figure 3. The market value of building right is simply the sellable building right multiplied by its price. This is the amount that an investor has to pay for the land, but housing companies will not benefit the whole amount. To achieve the income before the development fees, costs incurring from parking arrangements are deducted. Development fees vary by local authority. The *Land Use and Building Act* (Government of Finland, 1999) only delimits the maximum fee to 60 per cent of value added. City of Helsinki uses formula of 35 per cent of the value added subtracted by € 700,000. The plot has existing garages that have to be compensated

(€ 500,000), and easement parking for some 100 shareholders – arranging structural parking for these shareholders is very expensive (€ 2,750,000). Zoning costs paid by the landowner are more or less dependent on the new-built volume. The last row equals the net income available for the housing companies' refurbishment financing.

Scenario 1

In the more optimistic Scenario 1 the housing companies are able to sell all available land (three infill development sites marked in Figure 3). Proportional costs incurring from parking and zoning are the same as in the Base Case.

Scenario 1'

In normal circumstances the development fee would be quite high. Therefore, Scenario 1' applies a development fee similar to the Base Case. This requires negotiations between all the parties. In this scenario the local authority does not require the new development to be fully compensated because the housing companies choose the low-energy refurbishment option, which is € 4.1m dearer than the conventional facade. Therefore, the local authority relinquishes most of the development compensation in order to give the housing companies an incentive for low-energy refurbishment. With the alterations made in Scenario 1 the net income is over three times more than in the Base Case.

Scenario 2

In Scenario 2, instead of selling the infill development plots to external investors as in the Base Case and Scenarios 1 and 1', the housing companies use a sale-and-leaseback for € 500 per square metre of building right as the price of the land.

The seven housing companies own a total 151,000 m² of land in Siltamäki, excluding parking places and potential infill development sites marked in Figure 3. With a plot ratio of 0.52 this amount of land equals 78,400 m² of building right. If all this land were sold to the credit institution at € 500/m² it would result into an income of € 39.2m. It must be stressed that this income is not profit for the housing companies as selling of the building right is in the three previous scenarios and, similarly, the value of the property decreases. The credit institution requires a certain yield, for example an initial yield of 5 per cent would result in a annual rent of approximately € 2.0m .

Therefore, although the initial amount that can be used for refurbishment is significant, the housing companies pay it in the form of rent and possible redemptions. The advantages of this concept are that the costs are distributed over a long period and that it is flexible for the shareholders in different financial situations. In addition, it does not include the local authority to have an active role as an interest group, which can be considered an advantage.

Scenario 3

In Scenario 3, instead of refurbishment, the housing companies decide to demolish all the buildings and rezone the area corresponding to the present day's density practices still maintaining over-ground parking (this keeps the financial model simpler). Here a plot ratio of 0.9 is used which is equivalent to that in 1960's-70's suburbs of Pajamäki or Kuitinmäki in the Helsinki region (City of Helsinki Planning Department, 2007). The price of the building right is higher due to the anticipated price appreciation of the whole area from this new development.

Then new homes are built and the extra building rights sold to markets. Despite the fact that the scenario is speculative, the costs are based on real-life data. Based on this scenario the existing residents, by using the existing building right and paying approximately 1,800 €/m² would acquire completely new, energy efficient homes. The price is significantly higher than in any of the refurbishment scenarios but considerably lower than the average price of a new-built high-rise home in the Helsinki region of € 4,151/m² (Statistics Finland, 2010). This option enables the inhabitants also to negotiate on their home sizes.

Scenario conclusions

Table 4 presents separately for each scenario the refurbishment costs for the whole Siltamäki area after subsidies and potential investment income. In Scenario 1' the housing companies choose the low-energy alternative for facade renovations in an exchange for the lower development fee, and thus the initial refurbishment cost falls below the Base Case.

The last row presents the potential investment income as percentage of the initial refurbishment costs. In Base Case, this percentage is only 3.2 per cent – much less than the subsidies offered by the state (7.8 per cent). It is questionable if the housing companies will use the investment opportunity in this case.

With the alternations in Scenario 1 the percentage rises to 7.6, even 9.3 per cent in Scenario 1', which is a much more tempting figure from the housing companies' point of view and could result into real measures being undertaken.

Scenario 2 includes full use of the sale-and-leaseback generating rent costs to eternity and so the percentage of 67.7 is not comparable with other scenarios, due to the reduction of the equity value of current properties by the price of the land. Nevertheless, it is initially deducted from the refurbishment costs.

Scenario 3 shows the option for the People to get brand new homes instead of refurbished ones. This is hard to evaluate, because new apartments have different quality and their energy class is A or B. The disturbance to inhabitants is bigger than in refurbishment scenarios but it has not been valued in scenario.

These simple scenarios show that there are many possibilities for financing. Depending on the housing companies' decision and negotiations with the local authority, the initial cost of the refurbishment per average apartment in basis scenarios is over € 50,000. The other two scenarios provide option paying only € 15,000 of initial refurbishment costs or purchasing a new-built home for € 117,000.

	<i>Base Case</i>	<i>Scenario 1</i>	<i>Scenario 1'</i>	<i>Scenario 2</i>	<i>Scenario 3</i>
Net floor area/m ²	64250.5	64250.5	64250.5	64250.5	64250.5
Refurbishment costs/m ²	€ 901	€ 965	€ 965	901 €	N/A
(=) Initial refurbishment costs	€ 57,890,000	€ 62,000,000	€ 62,000,000	€ 57,890,000	N/A
(-) Public subsidies	€ 4,120,000	€ 4,740,000	€ 4,740,000	€ 4,120,000	N/A
(=) Refurbishment cost after subsidies / Scenario 3 new-built homes	€ 53,770,000	€ 57,260,000	€ 57,260,000	€ 53,770,000	€ 154,201,200
(-) Net income from Table 3.	€ 1,850,000	€ 4,729,000	€ 5,780,986	€ 39,200,000	€ 33,474,950
(=) Total refurbishment cost / Scenario 3 total cost	€ 51,920,000	€ 52,531,000	€ 51,479,014	€ 14,570,000	€ 114,301,200
Public subsidies / initial refurbishment costs	7.1 %	7.6 %	7.6 %	7.1 %	N/A
Investment income / initial refurbishment costs	3.2 %	7.6 %	9.3 %	67.7 %	25.9 %
Together	10.3 %	15.3 %	17.0 %	74.8 %	25.9 %
Per m ²	€ 808	€ 818	€ 801	€ 227	€ 1,779
Per average 65.5 m² apartment	€ 52,930	€ 53,553	€ 52,480	€ 14,853	€ 116,524

Table 4. Summary of refurbishment/redevelopment cost scenarios (new-built costs in Scenario 3).

All the scenarios are feasible to the Private as well and local authority only has to negotiate on development fees of an area that already has existing infrastructure. It is assumed that Private is interested in participating in partnership as it gives an opportunity to make profit. For the investor/developer this requires the purchased building right to be taken to use in reasonable amount of time. Local authority makes amendments to development fees and maybe to the existing detailed plans in order to enable housing companies to choose low-energy option. This reduces greenhouse gas (GHG) emissions of existing housing stock according to policies of Public.

7. Discussion

The purpose of this study is to show how energy efficient refurbishment could be partly financed by using external investments in housing companies' building rights and how the local government possessing the planning monopoly could set the scene for energy efficient refurbishment. A purely technical result is that the main stakeholders and critical variables in a redevelopment process of Siltamäki case were recognised. As a more conceptual result, beneficial for applying similar calculations also elsewhere, it can be stated that the 4P process seems to contribute in creating more viable options for the People, in this case the housing companies and their owners. Also the role of public sector is crucial in delivering viable redevelopments. 4P has hitherto been used in new developments and this paper shows its viability also in the vast mass of housing and decreasing housing related emissions remarkably.

The financial model presents a value creation strategy for older concrete suburban neighbourhoods undergoing refurbishments affecting energy efficiency. Instead of only adding costs to the owners and tenants, the framework has produced an option where the suburban redevelopment is considered an investment opportunity bringing potential value to both the internal and external stakeholders.

The financial analysis model presented is applicable for redevelopment processes in urban areas, where the building rights have a market and their relative price compared to construction costs is high. In Siltamäki new building rights are valued roughly only a fourth of existing home prices and a bit more than half of refurbishment prices. The options created work the better the bigger

proportion land price equals of housing costs as is the case in several areas of urban growth (Rudlin & Falk, 2009), in Finnish context this kind of areas are the existing neighbourhoods in the need of refurbishment in major cities. The ratio between existing and new potential building right is big enough to require changes for the detailed plan, but does not alter the nature of the area.

The neighbourhood in this case is an implicitly recognized entity of its own (Joutsiniemi, 2010; Webster, 2003). When this neighbourhood is considered as a handful of housing companies as here, the negotiations are possible to release the building rights and to extract value from them.

The Private finds Siltamäki interesting if it involves large-scale refurbishment or possibility of new development. This can happen only when the area is considered as whole rather than by individual housing companies. The community will benefit if it can direct state subsidies to the area. To achieve this is the local government could well negotiate on development fees and planning restrictions if the *vox populi* is unanimous – as is the case when 4P allows the People to have a seat on the negotiation table right from the beginning. This negotiation position created by 4P could also be used to negotiate some other amendments of public policies, such as the amount of parking spaces. Although this paper concentrates on the financial outcomes, there are also other important issues in the 4P collaboration. The Public aims to implementation of policies, such as ones on urban structure and climate change (Kuronen et al, 2011). All the parties benefit of the partnership synergy, otherwise the partnership would not actualise.

The research objectives were achieved by using a mixed methods approach, chosen due to its ability to deal with real-life problems. The data was collected from various sources. A theoretical approach used was Public-Private-People Partnership (4P). No previous studies were found that combine the 4P and redevelopment. However, a significant amount of research has been conducted on development and redevelopment cases. Major earlier findings include that property-led planning is highly dependent on public sector actions and policies (Rydin, 2010; Urbanavičienė et al, 2009; Weber, 2002; Imrie & Thomas, 1993). The 4P approach also underlines the interdependency of all parties. As Ball (2004) recognised, in a redevelopment situation the People partially even control the publicly-subsidised resources, as the various subsidies in Siltamäki case. In 4P processes the inertia of decision-making in housing companies can be

substantial as the individual owners' condition and situation of life varies. This has been shown to apply on the non-occupant landowners as well (Healey & Nabarro, 1990).

Small community development corporations are not resourced to carry on demanding redevelopment processes (Stoecker, 1997). This is why external investors are crucial, but similarly it becomes even more important to be able to show not only energy savings or lower GHG emissions but increased monetary values as well. The relationships between energy design decisions of existing multi-residential buildings, energy market and regulatory context are manifold (Atkinson et al, 2009).

Technically the facade renovation has a major influence in GHG emissions in refurbishment also in other climatic conditions than those found in Nordic countries (Hertzsch et al, 2010; Shiel, 2009). It makes sense to direct public financial incentives on actions that have a relatively high effect on GHG emissions.

The model presented and the scenarios contain some uncertainty due to some interpretations made. However, a wide professional workshop has discussed the model and approved it. There is a need for further development of the concept to better consider its multi-dimensional environment. The results from the workshop meetings and thematic interviews concluded that the issue is very important. The scenarios in the analysis allow People to see the potential development from a variety of perspectives, not just the one concerning their own housing company.

The financial analysis could also be used, or a new one developed, in case of a new development. New developments should have similar potential later in their life cycle, provided further building right is available at that time. The options in creating scenarios are manifold and each area has a different basis. By combining the sale-and-leaseback option with a demolition scenario new viable opportunities to finance refurbishments could be found. Also, the analysis lacks a time variable; the refurbishment takes time and the timing both affects prices as the housing market changes and generates interest expenses. The model assumes owner-occupancy, which in Finland is the most common form of tenure. Technically the calculations would work in rental housing as well, but the partnership synergy would be diminishing for the community would not equal the owners.

The Results chapter already presented the current policies that the scenarios take advantage of and the negotiations needed. In the current Finnish carbon discussion the Public interviewees saw the amendments rather possible, but policies may change.

The originality of this paper lies in the way the People's, as the owner-occupiers', point of view is included in a refurbishment/redevelopment process. Refurbishment processes have not been researched in this integrated way much despite that they present an urgent real life issue. Results of this paper are valuable to developers and other Private party representatives as well as policy makers, planners and housing companies in finding new ways to cooperate and make more redevelopment processes into economical and low-energy success stories.

8. Conclusions

This study rested on the proposition that a 4P approach can introduce more energy-efficient refurbishment options to choose from for an urban redevelopment process, which again provides more value to the stakeholders in form of achieving policy goals (Public), having new kinds of business opportunities (Private) and having new options to choose from (People). The financial model created here raises building rights and their pricing as the single most important variable concerning the possibilities. The current land ownership of housing companies can be transferred as equity to finance refurbishments.

By examining one specific case it was found that introducing 4P to a redevelopment process can be fruitful to all parties. It has been shown that 4P can bring the stakeholders closer to each other without anyone having to give up their position and that it can lead to a situation where energy efficient refurbishment can be affordable and the People can have several refurbishment and finance options to choose from. 4P, where the People are also included creates the possibility of equity financing also. Via the housing companies the People have good negotiating possibilities in redeveloping their existing neighbourhood.

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