



THE NATIONAL
RESEARCH INSTITUTE
PAPUA NEW GUINEA

SPOTLIGHT

THE NEED FOR ECONOMIES OF SCALE FOR LARGE HOUSING DEVELOPMENTS IN PAPUA NEW GUINEA

Logea Nao

Volume 17, Issue 6

www.pngnri.org

Key Points

- Economies of scale is an economic term which refers to a situation in which the producer of a good is able to produce more goods at lower costs because costs are spread over more goods.
- Papua New Guinea requires economies of scale in the housing sector to increase the supply of housing.
- To increase housing supply and achieve economies of scale, optimum size of land is required. Also, the cost structure for large housing developments needs to be understood.
- Achieving this can provide welfare gains for all – cost reductions for developers, and affordable housing for consumers.

inquire
inform
influence

May 2024



THE NEED FOR ECONOMIES OF SCALE FOR LARGE HOUSING DEVELOPMENTS IN PAPUA NEW GUINEA

By Logea Nao

Trunk infrastructure refers to shared physical structures that provide water supply, sewerage facilities, road network and electricity (Nao and Ezebilo, 2017). At the 2019 National Land Summit, the property development sector highlighted that a major challenge for the development of land and building of properties in Papua New Guinea is the deficit of trunk infrastructure and the high cost of providing trunk infrastructure (Niugini Land and Properties, 2019). This has been a continuing constraint that plagues the construction of residential developments in the urban towns and cities of Papua New Guinea (PNG). In particular, basic services like roads, electricity, piped-borne water and sewerage are either inexistent or inadequate in the development of land and housing projects. Constructing these infrastructures are costly, hence, the prices of the houses reflect the high input costs endured by the private developers. How do we reduce the high prices of owner-occupied and rental houses? In other words, how do we reduce the input costs of construction of houses, which in turn, reduce the prices of houses and provides the opportunity for all to own and live in a decent serviced house? The concept of 'Economies of Scale' is widely used to address large scale residential developments to ensure that the unit cost of houses reduce as more houses are constructed.

This article highlights the significance of economies of scale in addressing the shortage of housing in PNG. It provides a brief overview of this economic concept and its application in large scale residential developments. Furthermore, the paper highlights some of the necessary requirements needed to successfully overcome the prevailing challenges in the development of land and housing in PNG.

Economies of scale

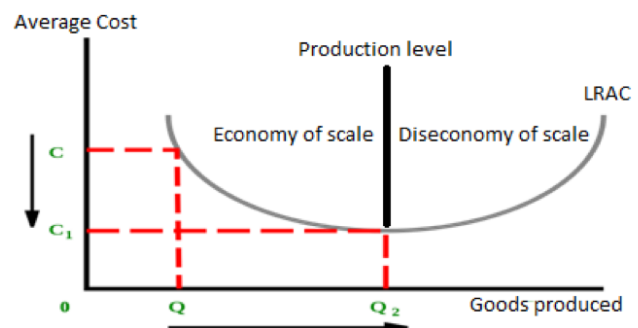
Economies of scale is a cost-saving or cost-advantage principle. It is a situation in which production becomes more efficient as the number of goods being produced increases (Kenton, 2022). Furthermore, economies of scale arise when a company is able to produce more goods at lower costs because costs are spread over a large number of goods (Kenton, 2022) – this is with specific reference to fixed costs,

where fixed costs are costs of production that do not change with increase or decrease in the quantity of production, often referred to as upfront costs (Vipond, 2019). To explain this point further, a mathematical representation is provided below, where given fixed costs (numerator), an increase in the quantity (denominator) results in a fall in the average cost of production (or per unit cost of production of the good).

$$\text{Cost per unit of the good produced} = \frac{\text{Cost}}{\text{Quantity}}$$

However, it must be noted that companies cannot continue achieving economies of scale as they increase the quantity of goods produced because beyond a certain point or level of production, diseconomies of scale kick in. Diseconomies of scale exist where an increase in the scale or quantity of production by a company leads to a rise in the average cost of production or per unit cost of production of the good being produced (Loo, 2019). To illustrate this point, a graphical representation is provided below in Figure 1. The horizontal-axis and vertical-axis represent the same variables (Goods produced and Average Cost, respectively) for economies of scale graph and diseconomies of scale graph. The cost of the good produced decreases from C to C₁ as the quantity of the good produced increases from Q to Q₂. Beyond production level Q₂, average cost begins to increase as production increases, or the quantity of the good produced increases. This represents diseconomies of scale.

Figure 1: Economies of Scale and Diseconomies of Scale



Source: Corporate Finance Institute, <https://corporatefinanceinstitute.com/resources/economics/diseconomies-of-scale/>

Why economies of scale for large housing developments in PNG?

Scale land is fundamental for development in PNG, especially large housing developments (Niugini Land and Properties, 2019). The short supply of State land in urban and peri-urban areas is a major constraint to increasing the supply of housing in PNG (Webster et al., 2016). Cost is a major consideration in the development of large housing estates.

For development of land for a housing or property development, upfront costs are quite high. For instance, Kutan (2023) highlights that un-serviced land (land without access to basic trunk infrastructure services such as roads, pipe-borne water, sewerage, and electricity) in Port Moresby and Lae is priced at a minimum of K100,000 and can go up to K150,000.

It is critical for connection of basic services such as pipe-borne water, electricity and roads to a given project area, for future occupants of the houses or properties to use and enjoy. However, trunk infrastructure is another major cost contributor for housing development. For instance, Ezebilo and Hamago (2017) concluded that the cost of trunk infrastructure alone at the completion of Phase 1 at Edai Town was K12.7 million, or 30 percent of the cost of building one house at Edai Town when combined with provision of the services.

To spread the cost of developing large housing estates, in other words, to reduce the per unit cost of building a house and consequently, increase the supply of housing in the country, scale land is required. With enough portions of land for housing development, more houses can be built, and therefore, costs spread over more houses. The reduction in the cost of building per house can provide welfare gains for the developer in terms of reduction in costs over time. Consumers or home buyers can also experience welfare gains through possible reductions in the price of a home because fewer costs are being transferred to the consumer by the housing developer.

What can PNG do to achieve economies of scale for housing developments?

To achieve economies of scale for housing developments in PNG, the following areas can be considered by relevant authorities.

Determine the optimum size of land for large housing developments

To deliver more houses to the market, scale land is required. To determine scale land for housing developments, the optimum size of the land for any estate would need to be identified on a case-by-case basis. Webster et al. (2016) proposed for 10 hectares of State land to be offered to each

qualified private developer. This is a good starting point. However, to guide the determination of the optimum size of land for each housing development project and to prevent inefficiencies in a housing project, standards and guidelines are necessary. The optimum size of land is therefore critical for a large housing development to achieve economies of scale in the provision of housing.

Understand the cost structure for large housing developments

A good starting point to determine scale land for large housing developments is to understand the cost structure of such developments. Such costs would include the cost of accessing land (State land and/or customary land) and the cost of developing trunk infrastructure. Webster et al. (2016) found that according to three major property developers in Port Moresby, areas that need further work in terms of research are accessing land, mapping out the process and length of time involved in the construction of trunk infrastructure, and reducing the input cost of construction of the houses. With the construction of trunk infrastructure being a major cost contributor to the development of housing estates, specific attention needs to be given to understanding the cost structure for different types of trunk infrastructure.

Improve the process of providing serviced land for large housing developments.

Webster et al. (2016) found that developers consider the cost of infrastructure and land as the major factors that inflate the prices of houses. In other words, the high cost of accessing serviced land results in the high prices of houses. The paper goes on to generally describe the process of supplying serviced land. However, information on the requirements in the process in terms of documents, as well as information on the length of each step in the process are also required to understand the areas in the process of providing serviced land that need to be improved. The process and requirements in the process, as well as the length of time involved in the process need to be reviewed with a view to improve the process and deliver more houses to the market at less costs and with less time.

Ensure that affected parties fully appreciate the need for and use of scale land.

Ezebilo and Hamago (2017) highlighted that State land is nearly exhausted so the focus should be on making customary land more accessible. In the event that a housing estate development is happening on customary land or on customary land that has been acquired by the State for housing development, the government and property developer must ensure that participating and affected landowners understand and appreciate the need for scale land. State service providers also need to fully appreciate the need for scale land for large housing developments, in terms of their planning and

delivery of utility services such as water, sewerage, electricity and roads. Private developers need to optimise the use of scale land provided for any large housing developments.

Adopt a holistic approach to delivering large housing developments.

There are multiple parties that collaborate to deliver any large housing development. The two main parties are the private sector and the public sector. In Webster et al. (2016), the private sector (together with State-owned housing providers such as National Housing Corporation) are referred to as the suppliers of housing, and the public sector referred to as facilitators and regulators. Kutan (2023) highlights that better coordination of housing initiatives is required in PNG. This suggests that a holistic approach is needed for the delivery of housing developments, whereby the private sector and the public sector collaborate to deliver housing development projects on time and within budget. Such collaborations can lead to improvements in the housing development process and reductions in costs.

Conclusion

Housing is a major need in PNG, especially in major towns and cities. To meet the high demand for housing, the supply of housing needs to be increased. One way to achieve this is through large housing developments. However, large housing developments currently operate in a high cost environment due to scarcity of available State land; high upfront costs of providing trunk infrastructure for basic services, including lengthy and cumbersome processes of getting greenfield land to be serviced; and, lack of coordination between housing providers in the private sector as well as public sector and facilitators and regulators in the public sector. To spread the cost of developing large housing estates, and as a result reduce the per unit cost of building a house, as well as increase the supply of housing in the country, scale land is required. To complement this, the cost contributors as highlighted in the form of challenges, need to be addressed. These include understanding the cost structure for large housing developments, and relatedly understanding the process and requirements to have greenfield land serviced and houses built; determining the optimum size of land or scale land; accessing customary land and ensuring that all parties involved in the delivery of houses on serviced land fully appreciate the need for and use of scale land; and, adopting a holistic approach in the delivery of large housing developments. Achieving economies of scale for large housing developments has the potential to benefit the developers through cost reductions and increase in profitability, and the consumer in terms of affordability through reductions in housing prices.

References

- Ezebilo, E. and Hamago, L. (2017). *Prospects and challenges in providing private sector provision of housing in Papua New Guinea: Lessons from Edai Town Development*. (PNG NRI Discussion Paper 157). Port Moresby: Papua New Guinea National Research Institute.
- Government of Papua New Guinea. (2019). National Land Summit 2019: Issues, Main Points and Resolutions. Port Moresby: Government of Papua New Guinea.
- Kenton, W. (2022). Economies of scale: What are they and how are they used? Retrieved from <https://www.investopedia.com/terms/e/economiesofscale.asp> (accessed 20 December 2022).
- Kutan, L. (2023). Public and private sectors collaboration is needed to promote affordable housing in Papua New Guinea. *PNG NRI Spotlight*, 16 (6).
- Loo, A. (2019). Economies of scale: Cost benefits from higher output levels. Retrieved from <https://corporatefinanceinstitute.com/resources/economics/economies-of-scale/> (accessed 29 June 2023).
- Nao, L. and Ezebilo, E. (2017). Trunk infrastructure must be established before houses are constructed: Lessons from the Duran Farm Housing Project in Port Moresby. *PNG NRI Spotlight*, 10 (7).
- Niugini Land and Properties (2019). National Land Summit Consolidated Report on the Stakeholder and Regional Workshops. Port Moresby: Papua New Guinea.
- Vipond, T. (2019). Fixed and variable costs: A guide to fixed vs variable costs. Retrieved from <https://corporatefinanceinstitute.com/resources/accounting/fixed-and-variable-costs/> (accessed 29 June 2023).
- Webster, T., Chand, S., and Kutan, L. (2016). *Property and housing policy development*. (PNG NRI Discussion Paper 149). Port Moresby: Papua New Guinea National Research Institute.

About the Author

Logea Nao is a Research Fellow with the Sustainable Land Development Research Program at the PNG National Research Institute. She holds a Masters and Graduate Diploma in International and Development Economics from the Australian National University. Her research interests include economic development, and land economics, policy and law.