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## Working Paper

# Land readjustment in Denpasar, Indonesia: Effects on land management, the spatial distribution of land prices, and the sustainable development goals

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**ADB Working Paper Series**

**LAND READJUSTMENT IN  
DENPASAR, INDONESIA: EFFECTS  
ON LAND MANAGEMENT, THE  
SPATIAL DISTRIBUTION OF LAND  
PRICES, AND THE SUSTAINABLE  
DEVELOPMENT GOALS**

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and Hideki Koizumi

No. 1148  
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**Asian Development Bank Institute**

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**Abstract**

The process to introduce the idea of land readjustment to a number of Asian developing countries—mainly sponsored by the Japanese government—has been one of the most significant international collaborations in urban planning in the twentieth century. When such processes succeed, they can replace old approaches and precede significant changes within planning cultures. By reviewing such changes, it is possible to understand how the long-term implementation of the planning instrument influenced both countries' institutions and cities' environment after many years. Considering the Sustainable Development Goals proposed by the United Nations, this work discusses an important aspect attributed to land readjustment: that is, landowners have an incentive to provide a land contribution to increase public spaces, because their net land price likely increases after the urbanization process. However, this work raises the concern that in a context of increased inflation and overlapping externalities, the increase in land prices is unknown and it provides a methodology to approach this question. The goal is to understand if land price disparities can be found by comparing land readjustment project areas with areas urbanized without land readjustment yet with similar characteristics. The present work analyzes Denpasar, Indonesia, more than 30 years after its first land readjustment pilot project was started, and evaluates changes in land prices throughout time, inside and outside some project areas. On the basis of results from the difference-in-differences estimator, some initial findings suggest evidence of the land readjustment treatment effect. Indeed, the maximum effect on the increase in land prices reaches about 33% when compared with areas urbanized without the planning instrument. In particular, the concentration of higher land prices represents a strong argument in favor of land readjustment, as the projects generated more social benefits than costs. By contrast, such concentration might be a problem if projects are fully subsidized by the Indonesian government without cost recovery land, and if the government is not properly collecting property taxes from project areas to redistribute surpluses to the society as a whole. The work concludes with a list of research limitations and with a critical view on land readjustment as implemented in Denpasar, aiming to properly achieve the Sustainable Development Goals.

**Keywords:** urban planning instruments, land readjustment, citywide impact assessment, land markets, difference-in-differences, urban economies

**JEL Classification:** R52, R31, R15, R51

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# 1. INTRODUCTION

## 1.1 Land Readjustment

After World War II, and following decades in which colonialism and colonial processes came to an end, a new agenda for the diffusion of ideas and models took place and international cooperation agencies became the main drivers to support the developing world in turning new projects into reality. Among different ideas and models, land readjustment has been practiced and transferred for more than 100 years, and recent decades have seen an unprecedented interest in this planning instrument. Perhaps this is due to its significant benefit to rights holders, as it is focused on community-based decision-making, and its expressive outcomes in countries like Japan, the Republic of Korea, and Germany. Land readjustment is a public-private partnership instrument that relies on the distribution of costs and benefits in urbanization processes by requiring that all property owners contribute a share of their property for public spaces, seeking, in principle, the maintenance of property titles after project completion. This planning instrument is mainly based on a contribution ratio in exchange for the provision of infrastructure, land registration, certification, and social facilities. Subsequently, land-related problems—especially those that are common in developing countries—can be solved during the development process. These include irregularly shaped lots, the scattered distribution of housing, the unfair advantage accruing to adjacent landowners resulting from the development of nearby lots, and the lack of recording and registration of land. Irregular lots are rearranged through a replotting exercise—changing the location, format, and area of several land plots—into well arranged, productive, and regular shaped lots, thereby alleviating physical and environmental problems suffered by the affected owners.

In addition, property owners contribute with land to sell to pay back the costs of improved facilities. Landowners bear the costs of urbanization at the time of development, and they have the incentive to do this, among other reasons, because their net land price likely increases after the urbanization process (Acharya 1988; Home 2007; Sorensen 2007). In other words, through land readjustment projects, the main contribution is in the form of land that will improve the public realm—roads, parks, sidewalks, and other public sites—and, consequently, increase private land prices. As purchasing land for public facilities can be prohibitively expensive, through the win-win potential of land readjustment and the sale of cost recovery land, it is possible to finance projects that would not be achievable through other means (Sorensen 2009). On the negative side, in practice, land readjustment is not easy to adapt and implement; it faces numerous challenges, including existing path dependent planning policies, the correction of coordination failures, and necessary institutional improvements and reconfigurations. As many collective actions are needed, the application of land readjustment gets more complex and complicated; in addition, inversely, that application may not serve the same goals in different economic and social contexts, under the penalty of misplaced ideas (Schwarz 1981). On the positive side, land readjustment has enormous potential to achieve fundamental democratic principles, such as (i) the just powers of government based upon the consent of the governed; (ii) political equality through the fair distribution of costs and benefits of the urban development; and (iii) transparent decision-making processes, including fair elections of the representatives in charge of implementing the project (De Souza 2018). However, the scale and quality of achievements related to land readjustment differ considerably from one city to another, especially when it comes to the initial stage and actual development conditions of the planning system of the 'recipient' city.

## 1.2 Case Study: Denpasar, Indonesia

When the debate on land readjustment arose internationally in 1979 (Doebele 2007), Indonesia was already experiencing several problems related to a massive growth rate of the urban population of 5% per year (Harun 1998). These problems included a shortage of urbanized land, informally and scattered building development, and the delayed and inadequate provision of network infrastructure. The adaptation process of land readjustment in Indonesia—known as *konsolidasi tanah*, or land consolidation—began when the head of Badung Regency together with other Indonesian government officials went to Taipei, China for training at the Land Reform Training Institute (Morita 1990). In Taoyuan, these officials also studied the Japanese *kukaku seiri* experience. Unlike in other countries, land consolidation began in Indonesia for land administrative purposes because the main task of the Directorate General Agraria (DG-Agraria) of the former Ministry of Home Affairs at that time was to carry out land management and administration (Harun 1998). DG-Agraria wanted to implement land consolidation as a way to change the method of land ownership and certification from the traditional and customary *Adat* law to newly established laws and regulations.

The term *Adat* law comes from an Arabic word meaning custom, and refers to a social organization classified into distinct types of independent legal community (Gluckman 1949). Different ethnic groups are meant to be governed according to their own diverse laws and customs. In Indonesia, some similarities between these groups can be found, including a distinction between earned property and inherited property. The earner may freely dispose of the former but not the latter, as inherited property becomes family property. Also, a community chief can reduce the usage period of the earned land and take over individuals' unused land for redistribution to the landless (Ter Haar 1948; Arens 1949). All members of the community shall have access to some arable land as part of the community's obligations. By working on a piece of land, the individual creates a legal relationship termed the 'native right of possession', that is quite different from the rights which, in developed systems of laws, are termed 'usufruct' and 'use'. Land-holding in *Adat* law is "held in the hierarchical organization of the society, and an estate-holder has a duty to allot land within his estate to his dependents who have a corresponding right to claim land from him" (Gluckman 1949, 64). Primary holders allot secondary estates of holding to secondary holders, who allot tertiary estates of holding to tertiary holders, and so on. All these estates may exist on the same parcel of land at the same time. Therefore, *Adat* law has conflicting implications and, in some situations, becomes the trigger for certain kinds of problem. Complications include the ritual and metaphysical sides related to land-holding and land transactions, to alterations of status, and to settlements of land-related injuries (Takano 2009).

Over the past decades, the Indonesian government has intensified efforts to recognize customary land rights by formalizing them through land consolidation. Formalization can help establish the legal validity of entitlements to land, thereby providing rights holders with legal certainty (Simarmata 2019). In this context, the staff in charge of the Province of Bali selected a project area to implement the first land consolidation project in the country. The project area was located in the Renon area, which included the Sumerta Kelod village and the Renon and Panjer village. These areas, previously satellite areas of the city of Denpasar and well known for producing rice, were to be converted into a settlement facing the buildings of the newly established provincial government (Putra 1993). Therefore, the idea of readjusting land for the first time in Indonesia could combine the legal validity of entitlements to land and the desire to safeguard the new regional administrative area from growing in a disorderly manner (Kusumadewa 1985). Initially, there was no expectation of a significant increase in land price above the value of

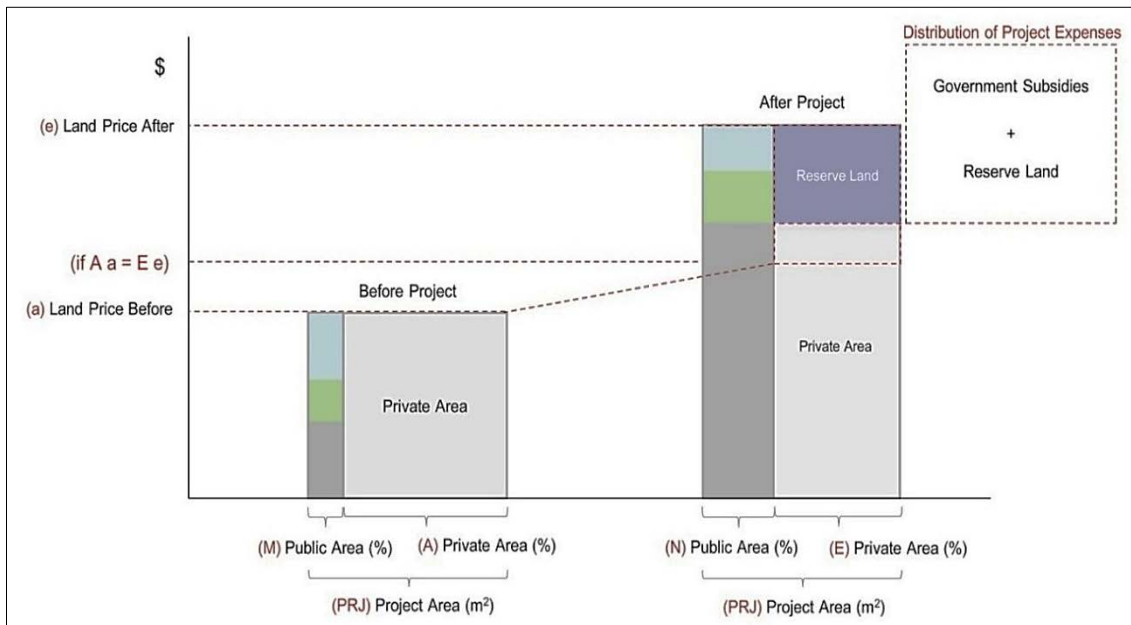
landowners' contribution that would justify the initial required contribution of 27% for public facilities (and reserve land). The community did not approve this ratio and the consolidation plan came to a halt, which required a newly formed project team to conduct intensive guidance directed to the affected community. Subsequently, a covenant was finally achieved due to a lower contribution ratio of 18%, followed by a jointly signed declaration by the landowners (Kusumadewa 1985, 128).

The Renon project, which started in 1982 and ended in 1985, did not include the installation of network infrastructures such as roads, sewage, etc., although it created a planned layout for the roads. The project "provided land for roads and some other purposes at no cost to the government; provided road access for each parcel while regularizing its shape; and, more importantly (from the viewpoint of DG-Agraria), provided to landowners registered title for their new parcel" (Harun 1998, 6). According to Nishiyama (1989), even if there was enough knowledge to forecast a further increase in land prices, the contribution of part of the earned or inherited property for reserve land—or cost recovery land—was legally impossible back when the Renon project was first planned. As a result, the government decided to implement land consolidation, paying the implementation costs afterward. Reserve land was only made possible after the Regulation of the Head of National Land Agency, No. 4 of the Year 1991, Concerning Land Consolidation, which approved three sources of funding: the national state budget, the local state budget, and community self-finance through the sale of reserve land. Such state budgets should fund all steps of land consolidation until the stage of land registration. In addition, the development of infrastructure such as roads should be funded by public work agencies.

Thus, the early land consolidation model implemented by the Government of Bali was fully subsidized without the sale of cost recovery land, which ultimately created a path dependent situation (Sorensen 2015) that has not been possible to change in Denpasar so far. Such an approach is different from the Japanese model (see Figures 1 and 2). Back in the 1980s, there was no legislation enabling cost recovery land and ensuring that landowners would get the investment back, and it became a more delicate problem since the implementers were government officials (Dharmawan 1989). Although national regulation has made the usage of cost recovery land possible since 1991, and the increase in land price returned to the landowners would allow them to give up more land area and still receive a good gain in land price, the majority of landowners still oppose it. Apparently, some landowners attach more importance to their land area than to its market value, despite the fact that the land consolidation pilot project in Renon dramatically pushed up the price of land after its implementation (Kusumadewa 1985; Putra 1993). Such a benefit also became apparent in subsequent projects, but it was still not possible to convince landowners to contribute to reserve land. Landowners whose plots of land have to be used for public facilities will have to accept a replacement with other plots that are sometimes situated far away from their original and ancestral places. Reserve land makes the scenario even more complicated due to this locational gap and the psychological relationship between the plot of land and everyone who was entitled to the said plot (Kusumadewa 1985; Tarigan 1992). Even with an already established *Adat* land swapping practice that makes the ongoing international advocacy on land readjustment make sense, landowners in Denpasar—especially in marginal agricultural communities—prefer simple types of land consolidation scheme that require small land reduction with fewer changes and less infrastructure provision (Harun 1998).

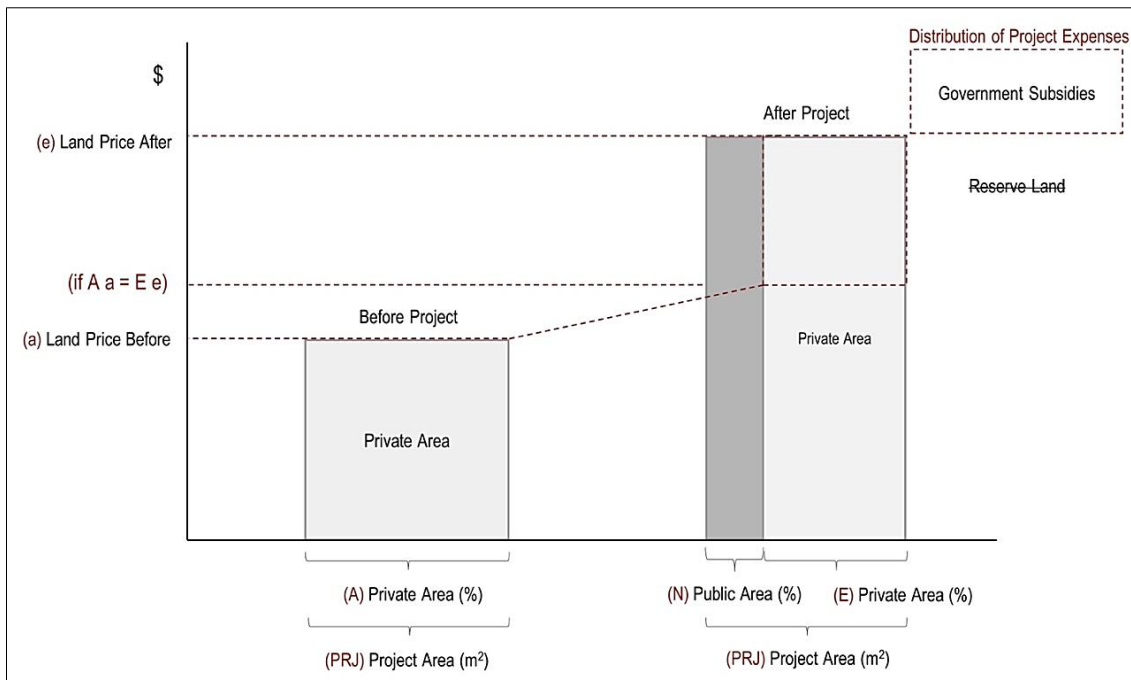


**Figure 1: Land Readjustment in Japan (*kukaku seiri*)**



Source: Authors, based on Yanase's (1996) theory of replotting.

**Figure 2: Land Readjustment in Denpasar, Indonesia (*konsolidasi tanah*)**



Note: Comparison between the Japanese land readjustment model (*kukaku seiri*), which relies on reserve land, and the land readjustment model (*konsolidasi tanah*), as applied in Denpasar, Indonesia.

Source: Authors.

Nevertheless, in the early days of land consolidation implementation in Indonesia, the goal of DG-Agraria to expedite land ownership and certification was achieved, leaving some project areas countrywide not fully developed. Subsequently, DG-Agraria was reorganized as the National Land Agency (*Badan Pertanahan Nasional*, or BPN) and,

from 1989 to 2002, six Japanese experts were dispatched to support land consolidation improvement and nationalization. Even after the continuous influence of the Japanese, and after the status of DG-Agraria was lifted to the ministerial level, land consolidation practices did not change: they are still, and even more strongly, focused on land titling objectives. Part of the reason for that is that “land consolidation projects enabled the National Land Agency to implement a planned subdivision layout in the absence of a land subdivision control law and regulations, and to confirm and record land ownership in a situation where many landowners do not have registered title to their land” (Harun 1998, 6). These are valuable benefits, and the latter is especially welcomed by landowners, motivating their participation in the projects.

### **1.3 The Problem Being Addressed**

One of the concerns of the present study centers on an aspect attributed to land readjustment: landowners have the incentive to provide land contributions to increase public spaces because the net land price may increase after the urbanization process. Many models seek to understand land price formation through enhancements by individual landowners or as a result of public policies, both of which consolidate urbanization processes. Based on derivations and standard assumptions, recent literature shows that the rise in the price of land is largely the result of public expenditure based on factors such as accessibility, infrastructure, and environmental conservation, among others (Nilsson 2013). However, there is the difficulty of consistently and accurately measuring that portion of increased land price that was due to public actions, and by which public actions, as opposed to private efforts such as capital improvements or effective management.

In the context of Denpasar, land prices have been skyrocketing for a considerable time, alongside land consolidation projects (Simamora, Subiyanto, and Hani'ah 2012). Other factors that play a role include foreign investments. Funds to buy property in Denpasar are coming from overseas, and although foreigners cannot own freehold titled land, several have bought large tracts of land with ownership limited for up to 80 years. Investment in property and real estate businesses in Denpasar is substantially financed by different forms of offshore funding, and the contrasting differences in land prices between Denpasar and investors' cities make it attractive for long-term investment (Silas 1993; Ramantha 2004). Aiming to compete for more investments, the Indonesian government also offers economic possibilities and simplicity in procedures, besides various comparative advantages such as deregulation, tax breaks, cheap labor, and abundant natural resources. Such practices have influenced the rise in property values, making it harder to evaluate the impact of land consolidation projects alone. When international agencies and government departments publish data on land prices from land readjustment projects, they usually publish data before and after projects' execution, without any update related to inflation or other external factors (see Table 1). This affords the incorrect understanding that the whole increase in land prices is down to projects' execution. In other words, many reports have promoted an increase in land prices without additional data, such as updating past land prices according to inflation (net present value, NPV), or data for land prices in other areas with no land readjustment implementation, to provide a more precise comparison and evaluation of the increase in land prices.

**Table 1: Land Consolidation Implementation in Denpasar since 1982 (as of 2000)**

Project Site	Area (Ha)	No. of Participants	Period of Implementation	Before Project, Average Land Price (Rp/m <sup>2</sup> ) (Year)	After Project, Average Land Price (Rp/m <sup>2</sup> ) (as of 2000)
Renon	77.258	395	1982–1985	30,000 (1982)	600,000
Lumintang	95.8096	511	1985–1986	25,000 (1985)	250,000
Nongkatoapati	95.05	587	1986–1987	10,000 (1986)	300,000
Yangbatu	29.3207	275	1986–1987	30,000 (1986)	750,000
Kantor Pos	34.7935	223	1989–1990	30,000 (1989)	450,000
Ubung Tukad Mati	200	847	1990–1991	20,000 (1990)	500,000
Padang Sambian Kaja	100	413	1991–1992	20,000 (1991)	100,000
Sumerta Klod Kedaton	74	428	1992–1993	30,000 (1992)	350,000
Panjer	50	395	1993–1994	25,000 (1993)	600,000
Renon Panjar Sidakarya	158	832	1994–1995	60,000 (1994)	500,000
Pamecutan Klod Semila	50	371	1994–1995	50,000 (1994)	400,000
Ubung Cargo	90.03	439	1995–1996	35,000 (1995)	400,000
Padang Sambian Kerobokan	16.58	76	1992–1993	60,000 (1992)	100,000
Total	1,070.842	5,792			

Source: Denpasar Municipality Government and National Land Agency (2000).

The Indonesian government historically maintains high interest rates attractive to foreign investors looking for a high rate of return. The combination of government incentives and high economic growth due to tourism activities supports a sharp increase in urban land prices in Denpasar since the 1990s. During the Asian crisis of 1997, the country suffered a loss of confidence and inflows of funds, experiencing a devaluation of its currency which led to high inflation. Therefore, understanding the Indonesian economy's history points to a concern that in a context of increased inflation, speculation, and overlapping externalities, the real increase in land prices after land consolidation projects is unknown. In order to approach this concern, the following sections will present an assessment of the central districts of Denpasar and six land consolidation projects to evaluate changes in land prices, comparing variation throughout time through an analysis of the econometric estimator of differences-in-differences.

## 2. METHODOLOGY

### 2.1 Research Design: Difference-in-Differences Estimator

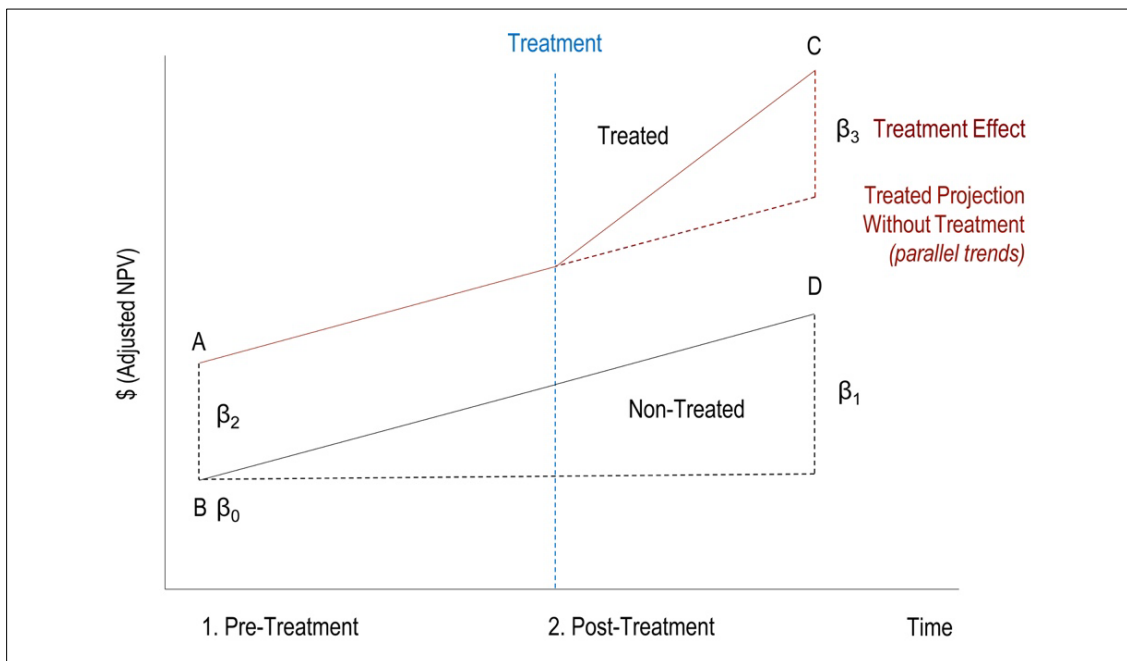
An objective of the present study is to use the difference-in-differences estimator to evaluate land price changes over time, inside and outside the land consolidation project areas. The goal is to understand if land price disparities can be found by comparing land consolidation project areas with areas urbanized without land consolidation yet with similar characteristics, such as the same urbanization period, the same distance from the central business district, and so on. Difference-in-differences is a statistical model that attempts to mimic an experimental research design using observational data. It is used to isolate the effect of interest—in this case, the urbanized land price per square meter—by comparing it with a control group. Thus, two groups are evidenced: (i) the control group, or non-treatment group areas, whose landowners were not the target of the urban planning tool to be evaluated; and (ii) the treatment group, whose landowners were targets of land consolidation projects.

The difference-in-differences estimator calculates the effect of a treatment on an outcome by comparing the average change over time in the outcome variable for the treatment group compared to the average change over time for the control group. The assessment of the impact on the chosen variable—urbanized land price—is based on the data of both groups, before and after the application of land consolidation and the execution of the projects. Although it is intended to mitigate the effects of extraneous factors and selection bias, the methodology uses as an assumption the parallel trend hypothesis, which might still be subject to certain biases (e.g., mean regression, reverse causality, or omitted variable bias). The parallel trend hypothesis contends that had the land consolidation project not existed, two similar areas would have had identical trajectories on an outcome over the same period. The benefit of using difference-in-differences relies on not needing other control covariates—such as income, schooling, etc.—to obtain results. Only four observations are necessary for an estimated regression: (i) the model constant; (ii) the year variable; (iii) the treatment dummy; and (iv) the dummy composed by treatment multiplied by time:

$$Y = \beta_0 + \beta_1 * [Time] + \beta_2 * [Intervention] + \beta_3 * [Time * Intervention] + \epsilon$$

where  $\beta_0$  is baseline average (B),  $\beta_1$  is time trend in non-treated group (D-B),  $\beta_2$  is difference pre-intervention (A-B), and  $\beta_3$  is difference in changes over time (C-A)-(D-B) (see Figure 3).

**Figure 3: Analytical Model for Difference-in-Differences Estimator**



Note: Difference-in-differences is implemented as an interaction term between time and treatment group dummy variables in a regression model.

Source: Authors, based on Card and Krueger (1994).

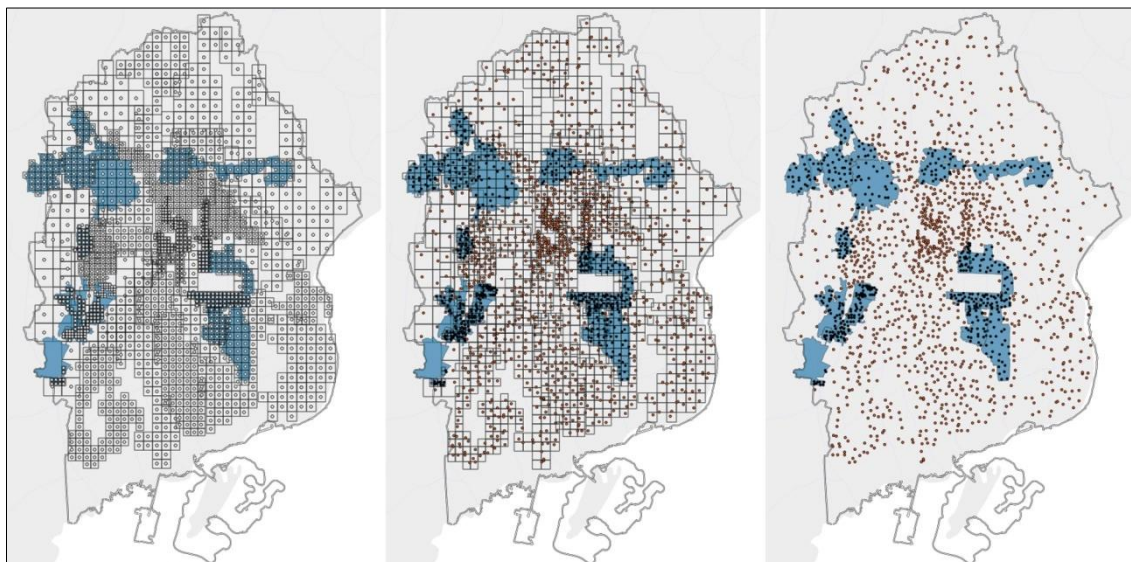
## 2.2 Data Collection Procedures, Sampling, and Randomization

The methodology related to this research relies on primary and secondary data collection and analysis. Secondary data were collected from a Master's thesis and Denpasar government reports from the 1990s that provided substantial, but limited, data related to land prices. The main goal of the thesis was to explain land price formation at that time, looking at independent variables such as the width of the roads facing the properties, the pavement condition of the road system, and the uniformity of the land plots (Haryoto 1997). Primary data were collected by an extensive survey in 2017, including 1,711 households, or 0.62% of the total number of households of Denpasar (as of 2017) with the support of the University of Udayana. For this population size (275,766 households) and the quantity of samples (1,711 questionnaires), there is a margin of error of  $\pm 2.36\%$  at a 95% confidence level, or two standard deviations (reasonably accurate, given that the percentage of the samples within the range is 95%). For the sake of the present work, the focus will be on samples gathered in the central districts of Denpasar and six land consolidation projects, considering primary and secondary data collection.

As mentioned, for primary data acquisition in 2017, a survey was conducted. Before starting it, a sampling plan strategy was used to provide potential randomization. The sampling plan strategy used was the random clustered (Smith, Goodchild, and Longley 2015). In this strategy, the target area is divided into larger segments based on the number of sampling units required to fulfill the research objectives (see Figure 4A). Within each segment, a single point is randomly distributed (see Figure 4B). Such a strategy is best compared to regular sampling and random sampling. Regular sampling presents problems because: (i) the sampling interval may coincide with some periodicity of the data in the study, resulting in considerable bias; and (ii) the set of distances of the samples being fixed can result in a loss of information on distance-related effects. Random sampling is also problematic, because some important areas may be left out of the study. To overcome such problems, random clustered sampling was therefore attempted, combining the benefits of the regular and random sampling methods. After establishing the proper strategy, randomization was conducted throughout Denpasar using GIS software (see Figure 4C).

As a general rule for this randomization process, public areas such as ring roads, parks, and major government facilities were left out, which is why some gaps can be found in the points distribution. With the list of tentative geographical points, the surveyors addressed households with a questionnaire asking the following questions: "What is the actual number of family members in the household? What is the estimated area in square meters of your land and of property? What is the actual transaction price (market value) of your land and your property, in your opinion?" In addition, to acquire past data, the following questions were asked: "When did you buy your property and for how much? Did you buy it just as land?" Ultimately, a dataset was built for land prices in three different years: 1978, 1982, and 2017. As mentioned previously, Indonesia in 1997 was severely exposed to the Asian financial crisis; thus, the country started to invest less in infrastructure, reducing the supply of urbanized land in a scenario of broad migration and demand. Imported components used in civil construction, such as machinery, became more expensive, leading the producer to incorporate this increase into the final price to the consumer. Within this context, due to macroeconomic externalities and inflation fluctuation of the Indonesian currency (Rupiah, Rp), all the collected prices were updated to the present value as of 2017 using the IDCPI 1969 index (*Badan Pusat Statistik*).

**Figures 4A: Clusters with Centroids, 4B: Randomization within Clusters, 4C: All Sampling Points**



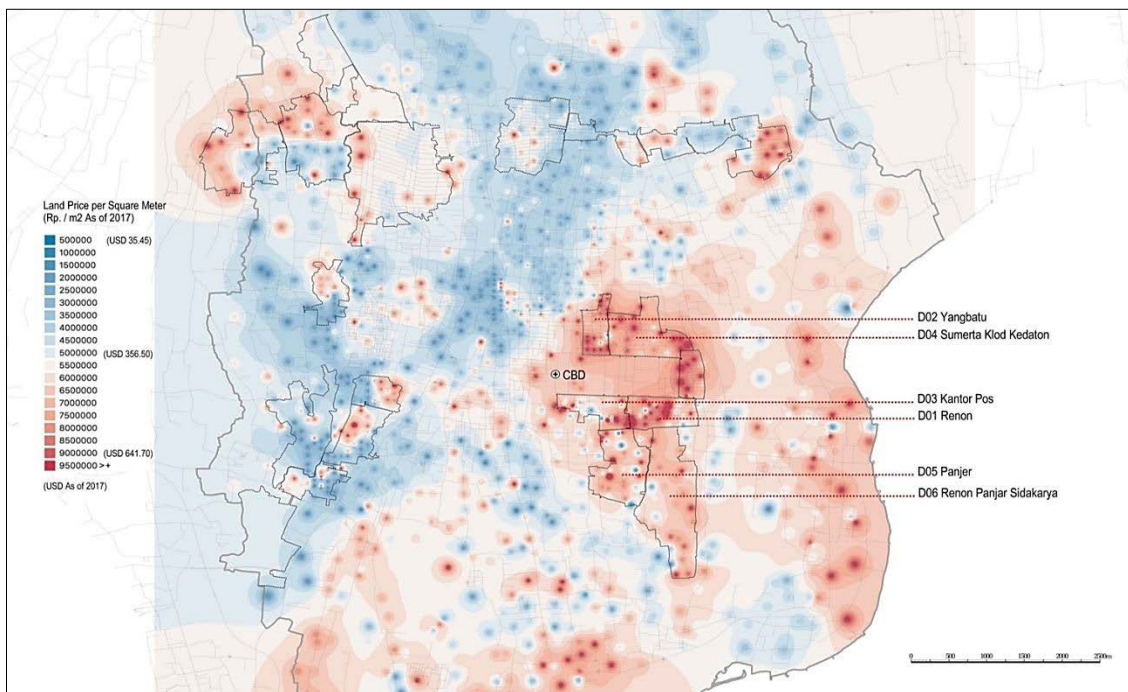
Note: Denpasar sampling process. Blue areas represent land consolidation project areas (the treatment group). By comparing before and after the project implementation, utilizing the difference-in-differences estimator, it is possible to evaluate regional disparities related to land prices inside and outside project areas.

Source: Authors.

Last, to properly evaluate the reliability of the answers collected in the survey, considering the literature related to problems with self-reported data and its limitations (Northrup 1996), the research also made use of real estate websites, and land and property sale prices in 2017, to be used as a control variable estimator. The problem related to self-report questionnaires, when the interviewee declares values, is that the quality of the answers can be doubtful (Walsh 1987). That does not mean that incorrect answers are given intentionally, but it may mean respondents may not have full and accurate knowledge of the requested information. Even in a context such as Denpasar, where the real estate market is widely debated and printed in local newspapers due to its high value, not every citizen will precisely know land and property prices. In other words, a control estimator was necessary to evaluate under- or over-estimations provided by the questionnaire respondents and, after a hypothesis test for the difference between the two means (data collected through survey and collected through real estate websites), enough statistical ground was found to attest they are the same population (means show a considerable overlap besides variance). The outcome from the survey was also declared accurate when compared with previous interviews with real estate developers and with Denpasar scholars when asked about valuable areas in the city (see Figure 5).



**Figure 5: Distribution of Land Price per Square Meter in Denpasar, Indonesia**



Note: Distribution of 1,711 samples according to the survey conducted in 2017, and the interpolation taken from the results of land price per square meter. Interpolation method was inverse distance weighting (IDW) using QGIS 3 software. CBD refers to the central business district, and dashed areas refer to land consolidation project areas. According to real estate developers and scholars from Denpasar, (i) in the east part, the price is high because it is a tourism location; (ii) in the downtown part, the price is high because it is the city center and governmental area; (iii) the south part is also a tourism area and very densely populated; and (iv) in the north west part, the price is high because it borders the Badung Regency (Padangsambian Kerobokan area), which is the most developed area in that regency.

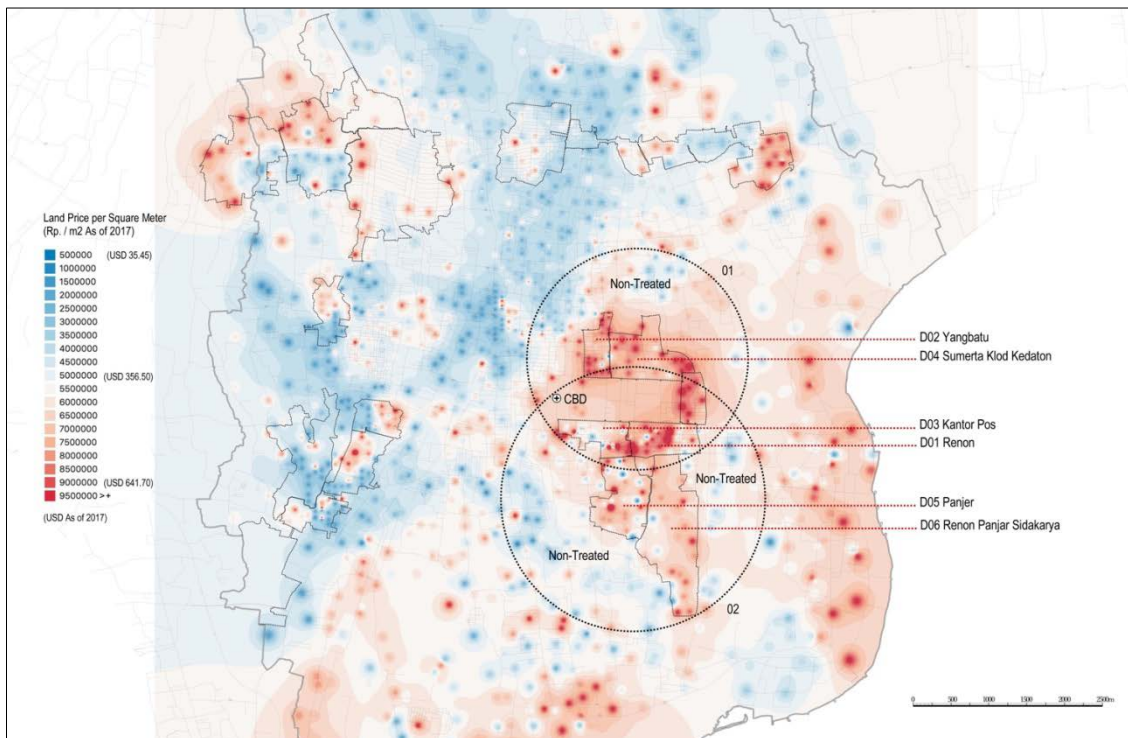
Source: Authors.

### 3. DISCUSSION

#### 3.1 Research Results

Within the context of the methodology proposed, the difference-in-differences estimator was used to calculate the effect of land consolidation treatment on land prices compared to the average change over time for the non-treated group areas. The estimator was used to isolate the effect of interest, excluding increased inflation and overlapping externalities as much as possible. Therefore, it focused on effects such as better planned roads than other areas, and consequently the concentration of businesses and better services, among others. Two circular regions were selected for this evaluation. In region 1, the treatment group consisted of Yangbatu and Sumerta Klod land consolidation projects, and the control group consisted of Denpasar Wards of Timur No. 1, No. 2, No. 6, No. 7, and No. 8. In region 2, the treatment group consisted of Renon, Kantor Pos, Panjer, and Sidakarya land consolidation projects, and the control group consisted of Denpasar Wards of Timur No. 1 and No. 2, and Selatan No. 6 and No. 7 (see Figure 6). The non-treated (control) group areas were selected using the same variables and conditions as the land consolidation treatment group areas (variables such as time of urbanization, distance from the central business district, existence of basic infrastructure, etc.), except for land consolidation projects, as much as possible.

**Figure 6: Selected Treatment and Non-Treatment (Control) Group Areas (Circle Regions 1 and 2)**



Note: In region 1, the treatment group consists of Yangbatu and Sumerta Klod land consolidation projects, and the control group consists of Denpasar Wards of Timur No. 1, No. 2, No. 6, No. 7, and No. 8. In region 2, the treatment group consists of Renon, Kantor Pos, Panjer, and Sidakarya land consolidation projects, and the control group consists of Denpasar Wards of Timur No. 1 and No. 2, and Selatan No. 6 and No. 7.

Source: Authors.

The analysis related to land prices using the difference-in-differences estimator in the first circular region was statically significant and treatment areas from 1982 to 2017 ( $p < 0.01$ ) performed, on average, 32.80% better than control areas (urbanized without land consolidation, yet with similar characteristics) (R-squared: 0.79) (see Chart 1). The parallel trend assumption held from 1978 to 1982 ( $p < 0.1$ ), as there was no evidence that there was a significant difference-in-differences over time before projects started. During that time, the difference-in-differences was not zero but small, at about Rp51,275 or \$3.64 per square meter (as of 2017) (see Chart 2). It was possible to find, therefore, a maximum treatment effect related to land consolidation in the first circular region on average of Rp2,876,317 or \$204.22 per square meter (as of 2017) (see Chart 1 and Figure 7).

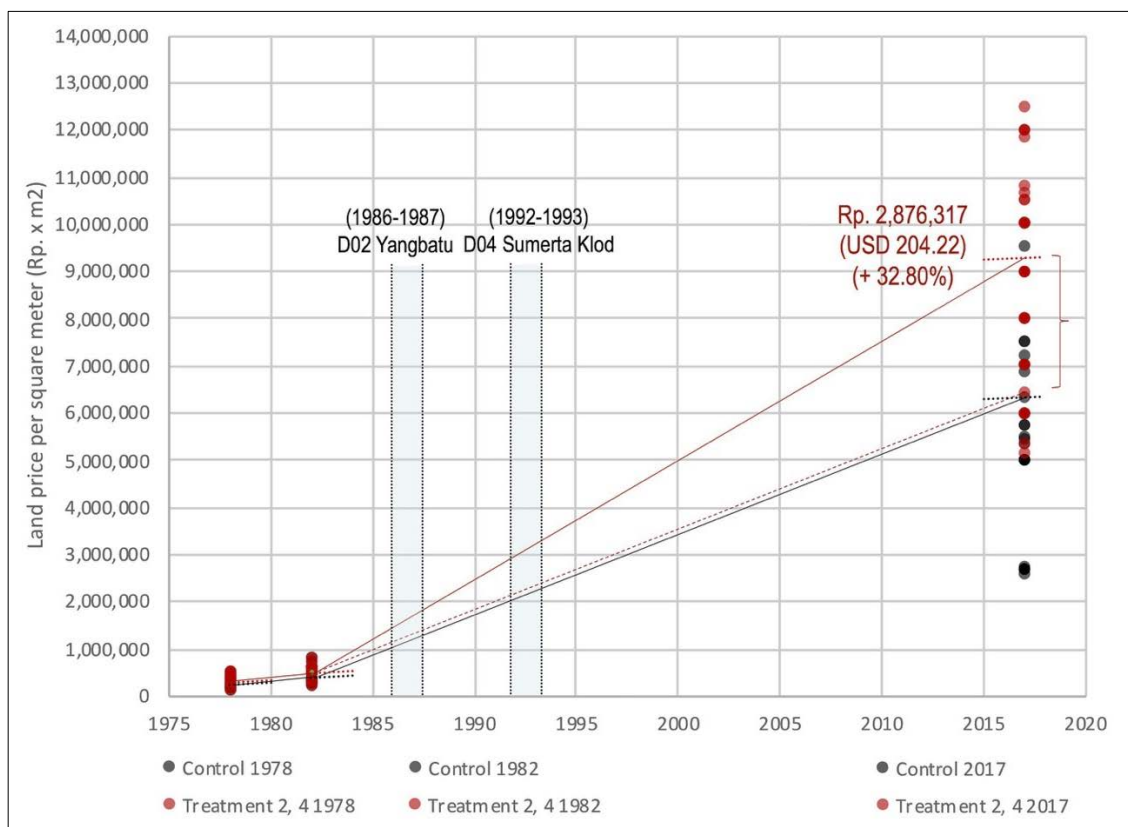


Chart 1: Difference-in-Differences 1982–2017					Chart 2: Parallel Trend 1978–1982				
Number of observations in the DIFF-IN-DIFF: 157					Number of observations in the DIFF-IN-DIFF: 157				
	Before	After				Before	After		
Control:	21	56	77		Control:	56	21	77	
Treated:	22	58	80		Treated:	58	22	80	
	43	114				114	43		
Outcome var.	Land ~e	S. Err.	t	P> t	Outcome var.	Land ~e	S. Err.	t	P> t
<b>Before</b>					<b>Before</b>				
Control	439,065				Control	178,628			
Treated	534,557				Treated	222,845			
Diff (T-C)	95,492	5.6e+05	0.17	0.865	Diff (T-C)	44,217	1.6e+04	2.80	0.006***
<b>After</b>					<b>After</b>				
Control	6,332,692				Control	439,065			
Treated	9,304,501				Treated	534,557			
Diff (T-C)	2,971,809	3.5e+05	8.61	0.000***	Diff (T-C)	95,492	2.6e+04	3.68	0.000***
Diff-in-Diff	2,876,317	6.6e+05	4.36	0.000***	Diff-in-Diff	51,275	3.0e+04	1.67	0.097*
R-square:	0.79				R-square:	0.71			
Inference:	*** p<0.01; ** p<0.05; * p<0.1				Inference:	*** p<0.01; ** p<0.05; * p<0.1			

Note: Chart 1: Land price per square meter in Denpasar, evaluated through difference-in-differences estimator 1982–2017 (adjusted NPV 2017). Chart 2: Parallel trend for land price per square meter in Denpasar, evaluated through difference-in-differences estimator 1978–1982 (adjusted NPV 2017).

Source: Authors.

**Figure 7: Difference-in-Differences Estimator (Region 1) (1982–2017) (Adjusted NPV 2017)**



Note: Treatment: Yangbatu and Sumerta Klod Projects; Control: Denpasar Wards Timur 1, 2, 6, 7, 8. Adjusting prices from 1982 to 2017: inflation over the period was 1,987.89% using index IDCPI 1969 (*Badan Pusat Statistik*); Initial Index: 6.69, End Index: 139.58.

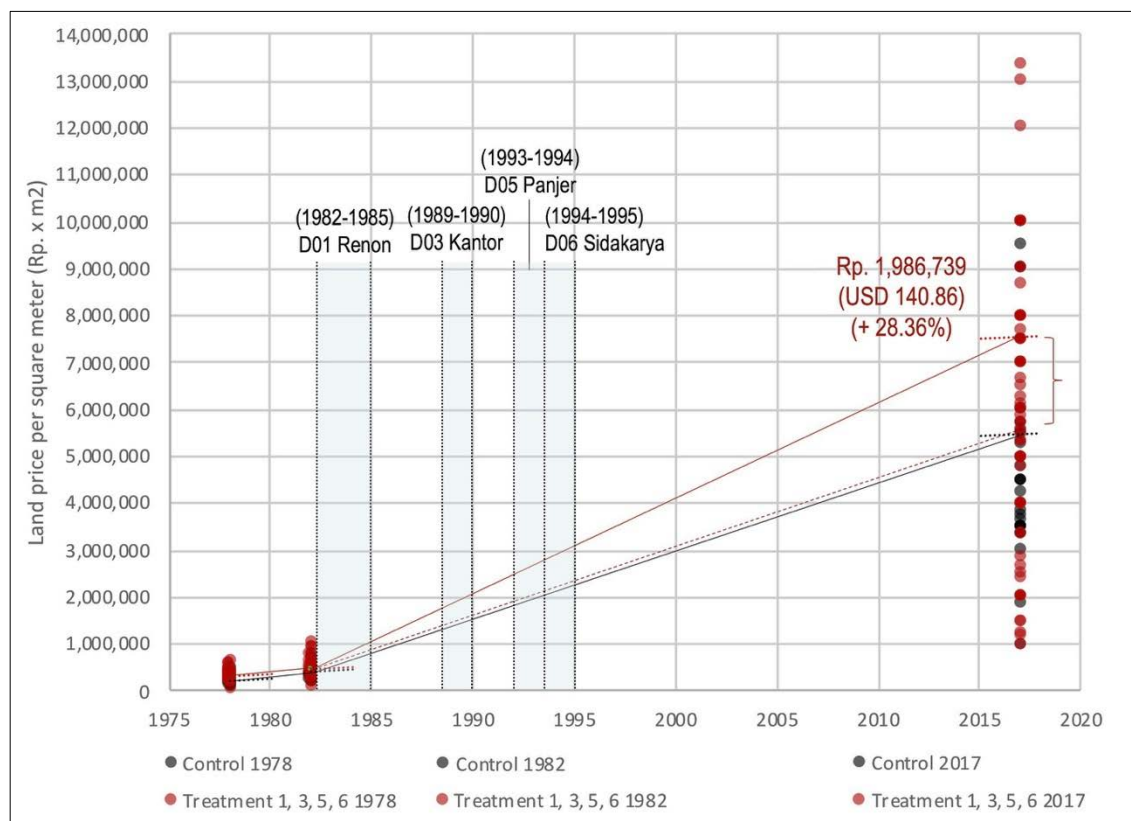
Source: Authors.

Chart 3: Difference-in-Differences 1982–2017					Chart 4: Parallel Trend 1978–1982				
Number of observations in the DIFF-IN-DIFF: 252					Number of observations in the DIFF-IN-DIFF: 252				
	Before	After				Before	After		
Control:	39	59		98	Control:	59	39		98
Treated:	40	114		154	Treated:	114	40		154
	79	173				173	79		
Outcome var.	Land_e	S. Err.	t	P> t	Outcome var.	Land_e	S. Err.	t	P> t
<b>Before</b>					<b>Before</b>				
Control	454,576				Control	301,093			
Treated	539,059				Treated	337,873			
Diff (T-C)	84,483	6.1e+05	0.14	0.890	Diff (T-C)	36,780	1.7e+04	2.22	0.028**
<b>After</b>					<b>After</b>				
Control	15,472,302				Control	454,576			
Treated	17,543,524				Treated	539,059			
Diff (T-C)	2,071,222	4.4e+05	4.74	0.000***	Diff (T-C)	84,483	2.3e+04	3.63	0.000***
Diff-in-Diff	1,986,739	7.5e+05	2.64	0.009***	Diff-in-Diff	47,703	2.9e+04	1.67	0.097*
R-square:	0.56				R-square:	0.40			
Inference:	*** p<0.01; ** p<0.05; * p<0.1				Inference:	*** p<0.01; ** p<0.05; * p<0.1			

Note: Chart 3: Land price per square meter in Denpasar, evaluated through difference-in-differences estimator 1982–2017 (adjusted NPV 2017). Chart 4: Parallel trend for land price per square meter in Denpasar, evaluated through difference-in-differences estimator 1978–1982 (adjusted NPV 2017).

Source: Authors.

**Figure 8: Difference-in-Differences Estimator (Region 2) (1982–2017) (Adjusted NPV 2017)**



Note: Treatment: Renon, Kantor Pos, Panjer, and Sidakarya Projects; Control: Denpasar Wards Timur 1 and 2, Selatan 6 and 7. Adjusting prices from 1982 to 2017: inflation over the period was 1,987.89% using index IDCPI 1969 (*Badan Pusat Statistik*); Initial Index: 6.69, End Index: 139.58.

Source: Authors.

The second circular region was also statically significant and from 1982 to 2017 ( $p < 0.01$ ), treatment areas performed, on average, 28.36% better than the control areas (urbanized without land consolidation, yet with similar characteristics) (R-squared: 0.56) (see Chart 3). The parallel trend assumption held from 1978 to 1982 ( $p < 0.1$ ), as there was no evidence that there was a significant difference-in-differences over time before projects started. During that time, the difference-in-differences was not zero but small, at about Rp47,703 or \$3.38 per square meter (as of 2017) (see Chart 4). It was possible to find, therefore, an expressive treatment effect related to land consolidation in the second circular region on average of Rp1,986,739 or \$140.86 per square meter (as of 2017) (see Chart 3 and Figure 8).

Some conclusions are possible from the research results. First, on the basis of results from the difference-in-differences estimator, some initial findings suggest evidence of the land consolidation treatment effect. Indeed, the maximum effect on the increase in land prices reaches about 33% when compared with areas urbanized without the planning instrument. In particular, the concentration of higher land prices represents a strong argument in favor of land readjustment, which means that the projects generated more social benefits than costs. Second, even controlling for inflation, and bringing past prices to net present value (NPV as of 2017), the prices for the first difference—before the project implementation—are low and seem to have a small effect on the second difference. In addition, when testing if the parallel trend assumption holds or not, the effect was not zero, but a really small effect of around \$3.50 was found. Therefore, past data helped to ensure validity of difference-in-differences in this research.

Additional analysis of the outcome of individual projects is necessary to understand the extra growth of almost 33% in prices, after 35 years of projects' implementation, in projects where the contribution was 20% of land on average. Such additional analysis will be made through the proportional ratio calculation. Proportional ratio is defined as the comparison between the previous and posterior land prices ( $a$ ,  $e$ ), and the previous and posterior area of the private properties ( $A$ ,  $E$ ), excluding reserve land (see Figure 1; if  $A * a = E * e$ ,  $Pr = 1.000$ ). Additionally, it is defined as the remaining ratio multiplied by the land price increase ratio ( $Pr = (1 - d) * y$ ). For instance, if the contribution ratio ( $d$ ) is 33.3%, the price per square meter is required to increase by 50% (land price increase ratio ( $y$ ) = 1.5) to maintain the equal balance of values between previous total plot value and posterior total replot value. In this case, the proportional ratio ( $Pr$ ) is 1, as follows:

$$Pr = (if A * a = E * e) = (1 - d) * y = (1 - 33.3%) * 1.5 = 1.000$$

By way of explanation, in the case of Denpasar, 20% of land contribution requires a 25% increase in the price per square meter of the remaining land to maintain equal total replot value:

$$\text{Denpasar (Indonesia): } Pr = (1 - d) * y = (1 - 20%) * 1.25 = 1.000$$

Note that the maximum treatment effect of almost 33% growth in prices refers to difference-in-differences, comparing areas urbanized with land consolidation with areas urbanized without land consolidation; it does not refer to the proportional ratio (see Table 2 for the proportional ratio calculation for all land consolidation projects selected for this work, which includes the proportional ratio calculation controlled by net present value (NPV) using the index IDCPI 1969).

**Table 2: Proportional Ratio for Land Consolidation Implementation in Denpasar (Adjusted NPV)**

	Project Site (Year of Implementation)	Area (Ha)	(A) Before Project, Private Plots (m <sup>2</sup> )	(E) After Project, Private Plots (m <sup>2</sup> )	Before Project, Land Price (Rp/m <sup>2</sup> ) (Year)	(a) Before Project, Land Price (Rp/m <sup>2</sup> ) (NPV Year)	(e) After Project, Land Price (Rp/m <sup>2</sup> ) (NPV Year)	Proportional Ratio (Pr = E e / A a)
1	Renon (1982–1985)	77.258	754,811	625,481	30,000 (1982)	42,900 (1985)	101,334 (1985)	1.957
2	Yangbatu (1986–1987)	29.3207	290,187	231,135	30,000 (1986)	35,500 (1988)	173,236 (1988)	3.887
3	Kantor Pos (1989–1990)	34.7935	346,891	277,513	30,000 (1989)	31,200 (1990)	127,539 (1990)	3.270
4	Sumerta Klod (1992–1993)	74	699,596	566,988	30,000 (1992)	32,300 (1993)	127,015 (1993)	3.187
5	Panjer (1993–1994)	78	764,868	611,910	25,000 (1993)	27,100 (1994)	238,231 (1994)	7.033
6	Sidakarya (1994–1995)	158	1,539,710	1,231,768	60,000 (1994)	72,900 (1996)	217,583 (1996)	2.388

Note: Inflation index IDCPI 1969 (*Badan Pusat Statistik*).

Source: Authors, compiling data from Morita (1990), Putra (1993), Denpasar Municipality Government and National Land Agency (2000), National Land Agency (2000), Sitorus (2009), and Suhesti (2015).

On average, the proportional ratio for these projects ranged between almost 2 (1.957) and 3.887, except for the Panjer project. The growth in value of private properties after the implementation of projects was high, with an increase of around 100% to 300% measured just after their implementation. In addition, these areas also can reach a maximum value 32.80% higher than areas urbanized without land consolidation yet with similar characteristics after 35 years. Further research is necessary to explain differences across project areas and why the proportional ratio was different even though the projects were conducted similarly. However, even after the high increase in value of private properties just after the project implementation, the difference in prices might have decreased, or increased, over the decades when compared with other areas urbanized without land consolidation. It was not possible to attest if the maximum treatment effect of 32.80% in land prices due to land consolidation projects had decreased or increased over time. Perhaps the initial growth in land prices in land consolidation project areas is quite significant but, over the years, other areas might develop and the difference might be reduced.

### 3.2 Research Limitations

Care must be taken in making inferences from these results, as the research described has some limitations. The first of these is the lack of other control variables. The price of land is essentially endogenous—its growth occurs at a rate determined by forces that are internal to the economic system; however, there are variables including economic crises or national policies, such as a policy of real estate credit in a given period, which can significantly affect the price of land. Considering the lack of this type of information, the parallel trend assumption was adopted without a precise evaluation being made attesting to this tendency. This is an intrinsic problem when evaluating programs over more than 30 years without the possibility of isolating a series of factors to ensure that they do not influence the results. To overcome this problem, future care must be taken in the selection of non-treated (control) areas and by using a hedonic type of regression

for treatment and non-treatment groups. What this means is that, besides the variables already used, it is necessary to add to the evaluation variables related to the characteristics of land and locations. Such variables might include as independent variables the shape of the land plot, distance from the central business district, tourist locations, social amenities, and selected infrastructures. In addition, this might solve difference-in-differences problems related to contamination and spill-over effects.

Second, data availability in developing countries is a problem, and collecting primary data for research is a challenge. With so many places with difficult access, and considering several limitations on administering the survey questionnaires, only a limited number of answers could be collected exactly in those sampling points listed (see Figure 4C). For example, some surveyors had to find neighbors when people in the chosen households did not answer (or refused to), or even when it was not possible to locate any household in the given sampling points. Thus, a perfect randomization process for data collection in urban areas is not possible. As land prices are not necessarily normally distributed and the sample size might not be large enough for the central limit theorem to have kicked in, it might be necessary to look at bootstrapping—random sampling with replacement—for future researches.

### 3.3 Conclusions

This work seeks to understand the long-term implementation of *konsolidasi tanah* in Denpasar, Indonesia, and how it influenced its urban environment after many years. In order to do so, to begin with, it is possible to address possible reasons why land consolidation made its way into the Indonesian planning system and why it has been extensively used in Denpasar since the 1980s. First, an already established *Adat* land swapping practice made the ongoing international advocacy on land readjustment make sense. Second, the titling program ‘imposed’ on landowners to formalize ownership through land consolidation was well received; in other words, land ownership in Denpasar is complicated, and it was relatively easy to convince landowners to participate in the projects, if the contribution ratio was low, as land consolidation was the only way to formally receive the title rights and certification. Third, despite the many years for the construction works to be completed, it became well-known to the Balinese society that the government was fully subsidizing construction work; thus, the rise of land prices after the implementation of land consolidation projects became an incentive for more projects’ initiatives.

Reviewing the international literature, land readjustment has been praised for several benefits, predominantly (i) its potential to preserve social, cultural, and economic networks through original community maintenance; (ii) its potential to finance and promote projects that would not be possible by any other means; and (iii) its potential to equitably distribute costs and benefits in the urbanization process (Sorensen 2009). On the other hand, the outcomes from the cases studied demonstrate that the land readjustment in Denpasar could not entirely fulfill all its promised benefits. First, the *Adat* law communities of Indonesia have long considered land to be an important way—if not the most important way—to represent their religious and cultural identities. However, the high increase in land prices just after the project implementation made it difficult to preserve social networks through the maintenance of the original community. In some cases, the majority of the long-term benefits of land consolidation are not going to the original landowners, but rather to the more affluent ones. Therefore, there is a concern that when land valuation in areas of land consolidation is excessive, it could favor the concentration of income in the project areas, expelling the original *Adat* law communities

and counteracting the notion of sustainable and inclusive development, a powerful argument in international development agencies.

Second, landowners have different attitudes toward the potential to finance and promote different kinds of infrastructure and living environments. The Balinese were ruled for centuries by a traditional and customary ownership system in which land was very flexibly documented, presented, and sanctioned, but communally recognized and accepted. Despite that, the initial strength of this system gradually weakened, especially due to the ongoing land demand, and landowners became more attached to land title certificates and less sophisticated infrastructure provision, focusing only on access roads. Even though there was clear recognition that land consolidation projects dramatically pushed up the price of land after their completion, it was still not possible to convince landowners to contribute more—with part of the earned or inherited property—for reserve land to finance projects with better public facilities. Landowners whose plots of land have to be used for public facilities will have to accept a replacement with other plots that are sometimes situated far away from their original and ancestral places. The prevalence is that landowners in Denpasar prefer simple types of land consolidation scheme that require small land reduction with fewer changes and less infrastructure provision. This tendency seems especially prevalent in marginal agricultural communities.

Third, projects might have not distributed the costs and benefits in the urbanization process equitably. Land price is an important signal that reflects a link between demand and supply, and social costs and benefits. Thus, it is an important variable to measure the performance and outcomes related to specific public policies and urban planning instruments. On the one hand, the growth in value of private properties after the implementation of projects was high, as an increase of around 100% to 300% was measured just after their implementation; furthermore, from the difference-in-differences estimator, some initial findings suggest evidence of the land consolidation treatment effect even after 35 years. Indeed, the maximum effect on the increase in land prices reached about 33% when compared with areas urbanized without the planning instrument yet with similar characteristics. In particular, the concentration of higher land prices represents a strong argument in favor of land readjustment, which means the projects generated more social benefits than costs. On the other hand, such a concentration might be a problem if projects are fully subsidized by the Indonesian government without cost recovery land, and if the government is not properly collecting property taxes from project areas to redistribute surpluses to the society as a whole. In addition, the benefits related to the increase in land prices could have been captured by the government in the long-run through the Land and Building Tax—levied at a single flat rate of 0.5% assessed on the capital value of land and improvements after the land consolidation project—if cadastral updates and properties' assessments were conducted by the government, which sometimes took years to happen due to limited human resources and restricted infrastructure for taxation management.

Finally, it is important to look at key lessons for policy makers seeking implementation of the Sustainable Development Goals through land readjustment. There are immense difficulties in the practical implementation of land readjustment through overcoming path dependent planning policies, correction of coordination failures, and institutional changes and improvement. Even after facing these challenges, it is important to recognize the limitations of land readjustment as implemented in Denpasar. Not a single park was implemented, and some other facilities, like a public school, were installed years later, after the end of the project, without the support of any cost recovery land. Therefore, the case study for Denpasar demonstrates that without reserve land, rights holders are very likely to absorb most of the project benefits, but without reserve land and consequently

major and diversified public investments, the overall benefits after the implementation of projects might not be as high as expected, especially in the long run. Other infrastructures impact property values in a much larger way than roads alone. That is a key lesson as to why land readjustment performs much better in some countries than in others.

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