Session 5
GIS-Assisted Mass Appraisal (GAMA) in Shenzhen

The views expressed in this presentation are the views of the author/s and do not necessarily reflect the views or policies of the Asian Development Bank, or its Board of Governors, or the governments they represent. ADB does not guarantee the accuracy of the data included in this presentation and accepts no responsibility for any consequence of their use. The countries listed in this presentation do not imply any view on ADB's part as to sovereignty or independent status or necessarily conform to ADB's terminology.

Presentation by:

Sissie Fung

ADB Consultant

Tokyo, 20-23 February 2018

Introduction

Economic growth and institutional reforms in China over the past two decades have created profound changes within the society

There is a growing need for policy reform to address rapid urban and rural development, changes in land uses, sky-rocking housing prices in mega-cities and devolution of certain authority to local governments

As part of China's gradualist approach to modernize, China has developed an advanced property valuation system in Shenzhen in anticipation of a future recurrent property tax

Shenzhen

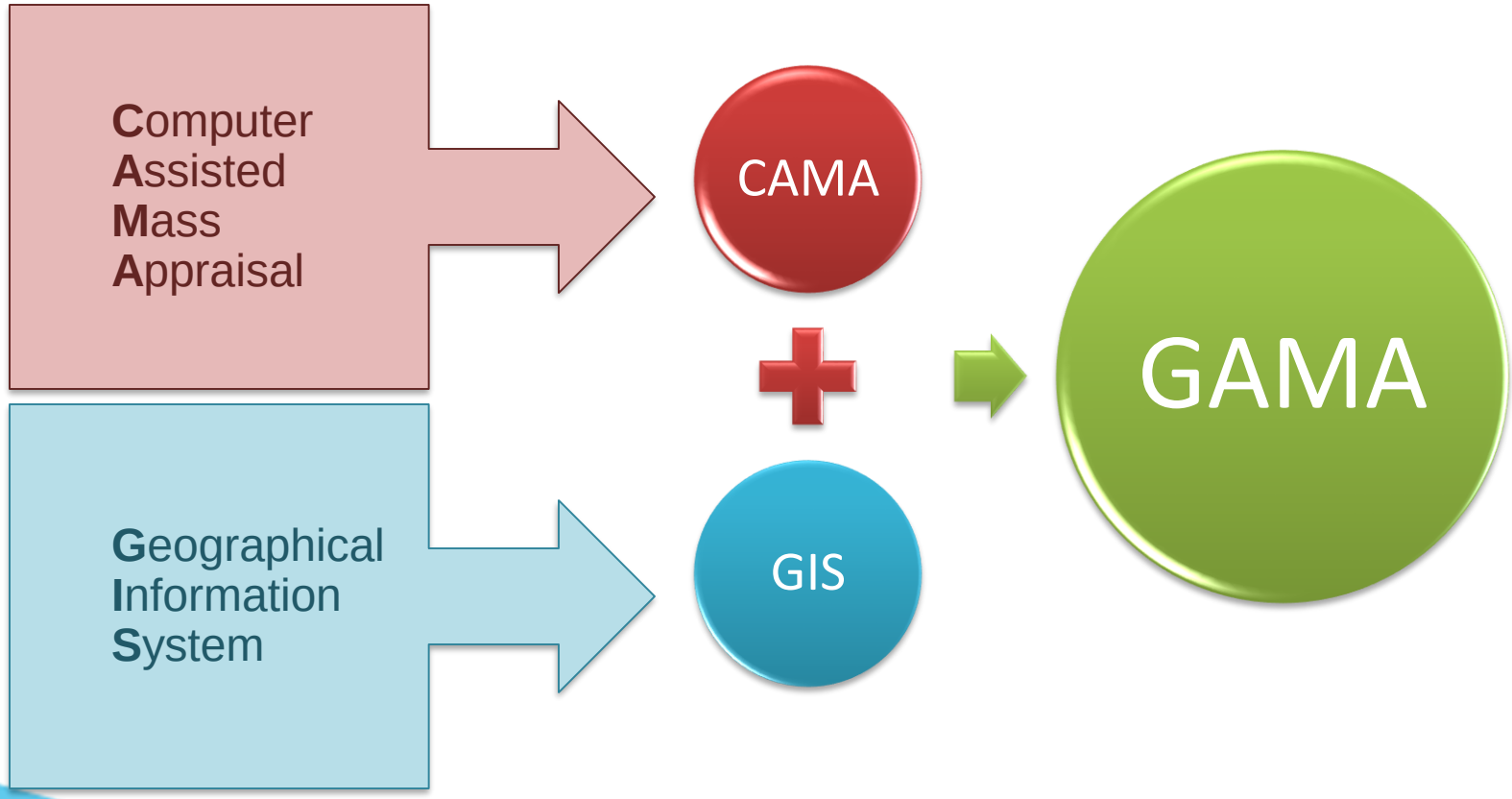
Established in May 1980, Shenzhen (a small fishing town of 30.000 people adjacent to Hong Kong) is the first “Special Economic Zone” in China to experiment with market mechanisms to attract foreign investments

In just over 30 years, Shenzhen grew into a mega-city, home to 12 million people and leading tech firms, and recorded DGP of USD 338 billion in 2017

As early as 2003, the central government started to consider introducing a property tax. Shenzhen was one of the 6 pilot experiment city for mass appraisal of properties

Features of the Shenzhen system

Merging CAMA techniques with GIS tools ("GAMA")



What is CAMA?

An automated valuation model that estimates the market value of class of properties based on market analysis of location, market conditions, property characteristics, transaction data etc.

- Providing reasonably accurate valuations at low cost
- Ability to produce a large number of valuations in a short space of time
- Ability to design a system which should improve in consistency and accuracy over time

- Less accurate than traditional methods of valuation
- Heavily reliant on the availability of suitable transaction/sales data
- Reliant on a high quality database of property information

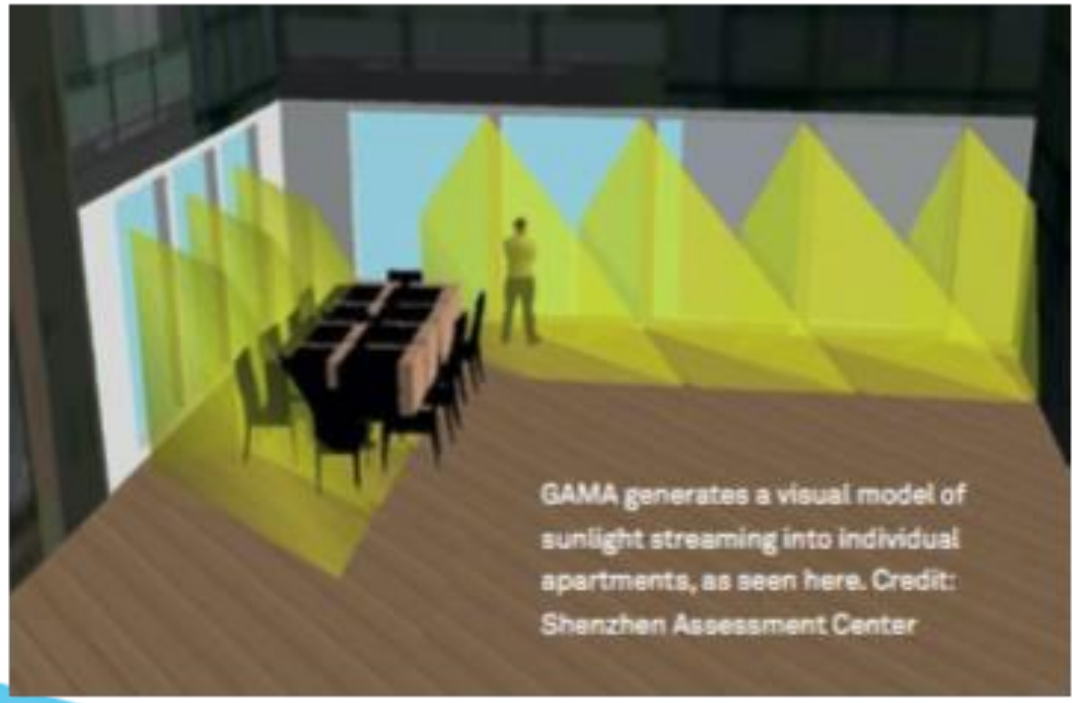
What is GIS?

GIS involves the ***development and/or utilization of hardware and software*** for the ***collection, collation and governance of data*** that can be, or is, ***referenced to a location*** which can then be ***analysed, visualized and manipulated to generate further data, provide an evidence base and geographically represent information*** in an effective, efficient and accountable manner.

McCluskey, A Primer on Property Tax Administration and Policy

Shenzhen's GAMA system

Using GIS, the system constructs 3-D models of entire cities, with streets, buildings, the individual properties within them, landscape features, and so on. The system can model the window vantage point of every single unit in a given building.



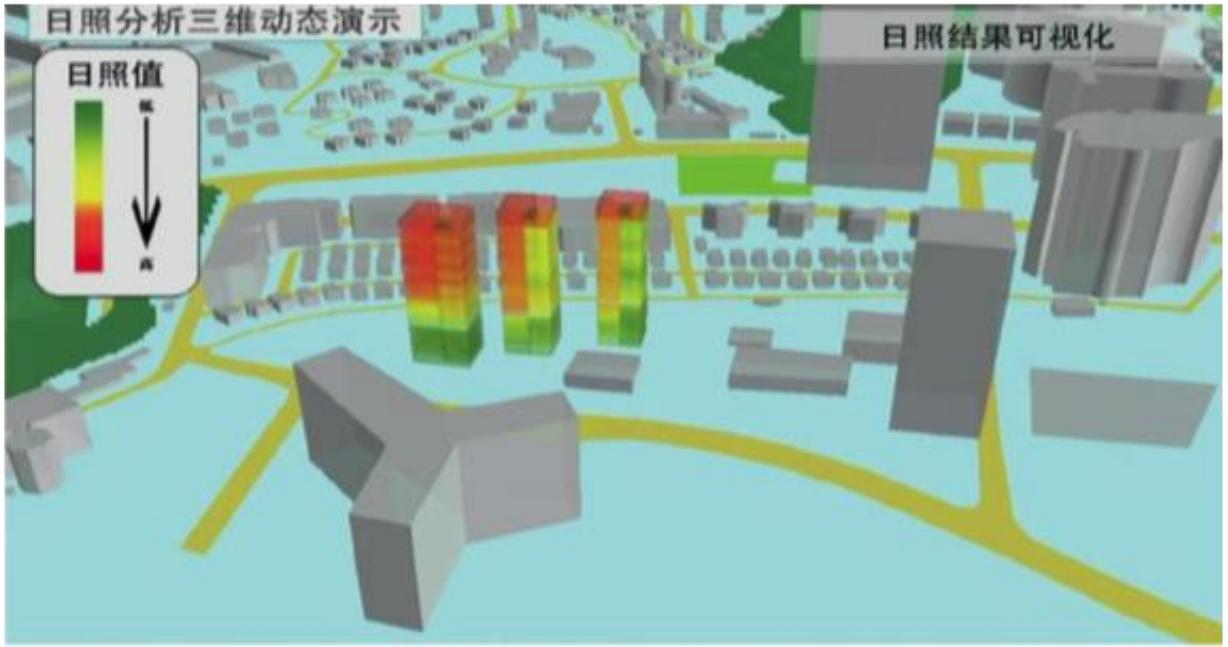
GAMA generates a visual model of sunlight streaming into individual apartments, as seen here. Credit: Shenzhen Assessment Center

Shenzhen's GAMA system

The Shenzhen assessment tool can track the sun's position, calculate the amount of natural light that a property receives, and assign a corresponding market value

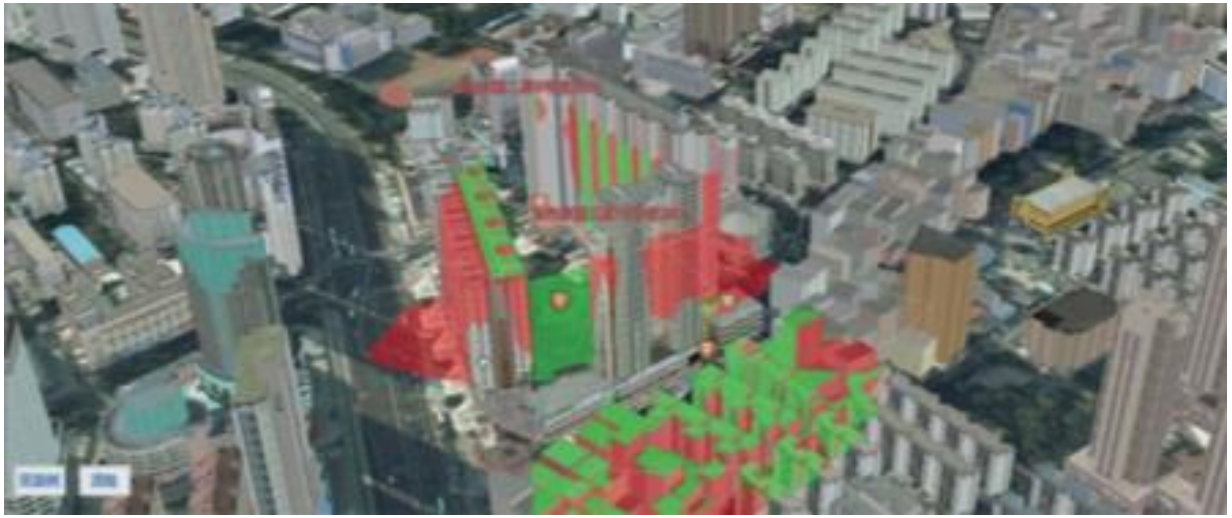
In this screenshot, apartments in the red zone are the most valuable, as they get the optimal amount of daylight according to local market preferences.

Credit: Shenzhen Assessment Center



Shenzhen's GAMA system

In addition to modelling daylight, the system can also model sound – a lower floor-unit facing a busy traffic intersection of a unit facing a peaceful courtyard.



In this screenshot, GAMA is projecting the line of sight from two different apartments; the green indicates areas visible from an apartment, and the red indicates areas blocked from view.

Credit: Shenzhen Assessment Center

Shenzhen's GAMA system

Challenges implementing the system:

- Shenzhen's real estate market is young, so the supply of transaction data is relatively scarce
- In addition, transactions are often reported at artificially low prices to avoid transaction taxes
- The housing market in Shenzhen is highly heterogeneous, with fairly distinct groups of housing types
- Due to the rapid growth of Shenzhen, a significant portion of buildings from newly annexed localities have not been brought into the system

Shenzhen's GAMA system

Opportunities:

- As a relatively new city, data on all buildings and floor plans is existing, complete and rendered in digital formats, which makes it relatively easy to adapt to the model
- As a SEZ, Shenzhen enjoys strong political support from the central government and the willingness from government agencies to cooperate and to share data

In a country where interdepartmental data sharing is rare, the system is probably an "only in Shenzhen" achievement that might be difficult to replicate elsewhere in China

Sources

Tom Nunlist, 'Virtual Valuation. GIS-Assisted Mass Appraisal in Shenzhen', *Land Lines*, October 2017

Ying Zhang, 'The Resident Property Tax Reform Pilot Projects in Shanghai and Chongqing', *IBFD Asia-Pacific Tax Bulletin*, March/April 2013

Yilin Hou, Qiang Ren, Ping Zhang, *The Property Tax in China. History, Pilots, and Prospects*, Heidelberg: Springer, 2015

Marco Salm, *Property Tax in BRICS Megacities. Local Government Financing and Financial Sustainability*, Bonn: Springer International Publishing AG, 2017.

William J. McCluskey, Gary C. Cornia, Lawrence C. Walters (Eds.), *A Primer on Property Tax, Administration and Policy*, Oxford: Wiley-Blackwell, 2013