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# BUSINESS RISK ASSESSMENT AND THE MANAGEMENT OF CLIMATE CHANGE IMPACTS



FOUR PHILIPPINE CITIES

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## ABBREVIATIONS AND ACRONYMS

<b>asl</b>	above sea level
<b>BAS</b>	Bureau of Agricultural Statistics
<b>BLIST</b>	Baguio, La Trinidad, Itogon, Sablan, and Tuba
<b>BPI</b>	Bank of the Philippine Islands
<b>CAR</b>	Cordillera Administrative Region
<b>CCPL</b>	Central Cebu Protected Landscape
<b>cmd</b>	cubic meter per day
<b>COA</b>	Commission on Audit
<b>CSE</b>	Crime Solution Efficiency
<b>DOT</b>	Department of Tourism
<b>ENSO</b>	El Niño Southern Oscillation
<b>FL</b>	Functional Literacy
<b>HDI</b>	Human Development Index
<b>LGPM</b>	Local Governance Performance Monitoring Systems
<b>MICS</b>	Management Information and Computer Services
<b>NSCB</b>	National Statistics Coordination Board
<b>NSO</b>	National Statistics Office
<b>OFW</b>	Overseas Filipino Workers
<b>PAGASA</b>	Philippine Atmospheric, Geophysical and Astronomical Services Administration
<b>PDIC</b>	Philippine Deposit Insurance Commission
<b>PNP</b>	Philippine National Police
<b>SLGR</b>	State of the Local Governance Report
<b>STEEP</b>	Society, Technology, Economics, Environment and Politics
<b>WWF</b>	World Wide Fund for Nature

## LOOKING THROUGH A CLIMATE LENS

The Philippines sits at the apex of the Coral Triangle. In May 2009, WWF released a landmark study entitled *The Coral Triangle and Climate Change: Ecosystems, People and Societies at Risk*. Assembled by 20 experts, utilizing inputs from 300 peer-reviewed articles, this report spelled out six likely climate scenarios for this region. These scenarios are:

**(1) El Niño Southern Oscillation Events (ENSO) are likely to continue as a significant source of inter-annual climate variability in the Coral Triangle region.** Although inter-decadal annual averages may remain relatively constant in some areas, the extreme “peaks and troughs” that characterize ENSO-related phenomena will make it increasingly difficult to accurately predict weather patterns for purposes of planning and normal business operations.

**(2) Sea Surface Temperatures are likely to be between 1 to 4 oC warmer by the end of this century.** In a pattern similar to ENSO phenomena, evidence from the Philippines already indicates annual 4oC to 5oC spikes above what has long been regarded as normal sea surface temperature. As this continues, the negative impacts on coral reef health as well as demersal fisheries will be profound and systemic. Fish will no longer abound as a wild food. Protein scarcity may emerge as a societal concern.

**(3) Ocean Acidification will likely make the aragonite saturation state “marginal”, within the period from 2020 to 2050, for coral reefs and marine life that require calcium carbonate.** In essence, this shift in the ocean’s Ph levels will lead to widespread coral reef death. Shrimp cannot develop skins. Oysters cannot develop shells. Fish larvae may no longer be able to develop bones.

**(4) Sea Levels are likely to rise from +4 to +6 meters due to the possibility of the melting of the large land-based ice sheets in Antarctica and Greenland.** In parallel to increases in sea surface temperatures, current data already shows increases in sea surface heights, particularly in El Nino episodes in tropical latitudes – such as the Philippines. This will contribute to sea level rise, as well. The possible timing remains uncertain.

**(5) Tropical Cyclones are likely to become more intense.** Although there is no clear consensus, whether the location or frequency of tropical cyclones will change in a warming world, tropical cyclo-genesis is already being recorded in areas that had previously been inhospitable for the birth of storms.

**(6) Rainfall, River Flow and Flooding are likely to become more extreme.** Over the last century, global precipitation data has shown a clear and steady increasing trend. The inter-annual variability of monsoon rainfall in the Philippines is likely to increase. Some parts of country are likely to experience an **upward trend in rainfall**. Inversely, some other parts of the country are likely to experience an **intensification of drought** associated with highly unpredictable rainfall deficits. These two poles of climate will make it increasingly difficult for traditional agriculture and aquaculture to remain viable. All aspects of normal life, for that matter, will become increasingly prone to disruption and dislocation.

Traditionally, the Philippine climate map breaks down our weather into four climate types. This climate map is likely to change. The Philippines sits in a portion of the planet that experiences the strongest and greatest number of tropical cyclones. These storms are another phenomenon that is expected to continue and storms are expected to intensify.

The specific mix of climate impacts will vary from place to place, and from year to year. These impacts will be non-linear. **In a manner echoing El Nino, high inter-annual variability and, therefore, increasingly difficult predictability, will be one cross cutting pattern characterizing climate change in the Philippines.**

Data from the Manila Observatory has predicted that, following historical patterns and inter-decadal trends, there is an indication that the northern portions of the Archipelago are more likely to experience climate impacts relative to an intensification of cyclones and rainfall. In contrast, the southern portions of the Archipelago are more likely to experience intensified climate impacts relative to increased temperatures and drought. This does not mean that the northern portion will stay wet, and the southern portion will go dry. These are multi-decadal trends. The confounding feature of this scenario is that “peaks and troughs” between wet and dry will persist as inter-annual variability. These dramatic swings in weather, from year to year, become increasingly evident or pronounced with time.

In the matter of related effects, cities bound by steep slopes, such as Baguio, Cebu and Davao, are likely to experience landslides in association with episodes of extreme rainfall and soil saturation. This is not the case for Iloilo, surrounded by relatively flat or gently sloping terrain.

It has taken more than a century for humankind’s carbon emissions to take us to this tipping point. All indications point to the likelihood that dealing with climate change will be a trans-generational challenge. It is likely these impacts will get worse before they can be addressed at a global scale and allow climatic stabilization.

## TAKING AN IN-DEPTH, CITY-SPECIFIC VIEW

### Methodology & Scope of the Assessment

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We have attempted to look thirty years into the future. This study zeroes in on four major Philippine cities: Baguio, Cebu, Davao and Iloilo. In order to provide a more comprehensive grasp of likely future trends that (a) build on existing climate studies while (b) distilling city-specific socio economic information, as well as (c) drawing from experiences of local stakeholders, scenario building exercises were used to encourage “out of the box” thinking and generate plausible narratives that could be useful for strategic planning. Defined as a “process of carefully crafting a set of divergent stories about the future to sketch the realm of the possible as means to link the uncertainties of the future to the decisions that must be done today”, scenario building can help planners and decision makers understand and deal with the uncertainties that lie before them. At the very least, scenario exercises can serve as a “rehearsal” for communities, giving them an opportunity to anticipate possible futures, as well as points of indication, as they begin to unfold. Good scenarios are relevant, divergent, insightful, and plausible.

### THREE VECTOR ANALYSIS

**Climate / Environmental Exposure** - Utilizing the same parameters as WWF’s study on the Coral Triangle & Climate Change, each city-scale assessment starts with a listing of likely local climate scenarios for each city. These scenarios were juxtaposed against city-specific weather information for a 20-year period, from 1990 to 2010. With the above information as basis, a city-specific score was given for each of the six parameters. These scores were then averaged out to generate a Climate / Environmental Exposure rating.

**Socio-Economic Sensitivity** – In this second portion of the study, a spectrum of variables were utilized to gauge each city’s socio-economic sensitivity. These include: Population, Agriculture, Tourism, New and Existing Businesses & Investment, Health and Educational Enrollment. As much as possible, this portion utilized 20-year data, from 1990 to 2010. With the above information as basis, a city-specific score was given for each of the six parameters. These scores were then averaged out to generate a Socio-Economic Sensitivity rating.

**Adaptive Capacity** – This third portion of the assessment highlights variables that reflect a city’s ability to implement adaptation strategies. The data obtained covered a 20-year period, from 1990 to 2010. The variables utilized included: Labor / Work Force, Family Savings, Functional Literacy, City Revenue / Expenditures / Reserves, Banking Data and the city’s scores for LGPMS, Crime Statistics and the Human Development Index. With the above

information as basis, a city-specific score was given for each of the six parameters. These scores were then averaged out to generate an Inverse Adaptive Capacity rating.

## **SCENARIO BUILDING**

In order to help further enrich and ground-truth the assessments through generation of local multi-stakeholder input, a scenario building exercise was conducted in each city. Since climate impacts will be non-linear, each economic sector will have a different (positive or negative) exposure to climate change, depending on its own specific characteristics. Considering their significant stake and critical contribution to the development of the city's economy, key business and local government leaders were invited to participate and get involved in the exercise. In essence, these exercises involved a number of steps.

(a) Local stakeholders selected a list of development drivers. They were asked to reveal what they see as the big shifts coming in society, technology, economics, environment and politics (STEEP) factors. They were encouraged to think about what are causing and driving these factors and select which might be of particular local importance.

(b) This was followed by the development of the scenario logics, first through an uncertainty analysis, whereby the stakeholders were asked to characterize what they were reasonably certain of, or uncertain about the drivers identified.

(c) The next step involved a process where stakeholders were asked to identify and rank the most and least important and influential of these drivers.

(d) Stakeholders were then divided into break-out groups where participants were asked to define / describe the best and worst case scenarios for each development driver.

(e) Returning to plenary, all drivers and their positive/negative manifestations were organized into a four-quadrant matrix containing best-best, best-worst, worst-best and worst-worst scenarios.

(f) This was followed by the division of the all participants into four groups who were each assigned to draw up a storyline, covering a 30-year period (2011-2040), using the characteristics of one of the four scenarios as the skeleton of their script. They were asked to identifying key events that may happen within the timelines. Participants were encouraged to push the storyline towards the most positive or most negative possible outcomes, to provide snapshots of the future, based on the priority drivers identified.

(g) Lastly, each group relayed its story sketches during the closing plenary.

The scenarios built during this exercise can be included in scenario planning, which is a powerful tool to capture the realm of possible developments and

providing the basis for proactive options and decision-making. However, planners and decision makers should be mindful and monitor “early warning signs” or indicators that scenarios are unfolding and identify implications that work in all of the scenarios in order to have appropriate strategies and robust plans in place.

## **INTEGRATION and FINAL ASSESSMENT**

Taking inputs from both the Three Vector analysis as well as the Scenario Building Exercise conducted in each city, an integrated assessment was made, and a score was then generated for each city. This could provide an indicative rating of each city’s economic vulnerability to climate change impacts.

We know that climate impacts are going to be site-specific, and non-linear. We also know that climate is altering many basic business assumptions, as well as creating a new menu of economic options available to each city.

**In response to climate / environmental exposure, the opportunity for cities is to make investments in site stabilization initiatives founded on future scenarios, that allow unhampered economic activity as well as access to social and environmental services. Consolidation is a crucial first step.**

**In order to minimize socio-economic sensitivity and maintain competitiveness, the opportunity is for cities to encourage proactive reconfiguration, and steer new investment toward climate-appropriate technology, skills, infrastructure, and systems that deliver on both current and future needs. Needless to say, good governance will be essential, steered by a well-crafted long-term plan that is founded on integrated area development. Population and urbanization trends establish beyond doubt that, as a city’s footprint expands, its dependence on external resources increases, as well.**

**No one can define the scope and sequence of climate change with absolute certainty. That being the case, adaptive capacity becomes an essential asset. An investment in societal reserves – in the form of both human and financial capital – provides one reactive buffer to unforeseen circumstances.**

It is hoped that the assessments that emerge from this study serve to provide both the business sector and local governments in these four cities with a better understanding of specific activities and sectors that may be steering their economy toward decreased viability and increased vulnerability. It is also hoped that this may be a springboard for new investment incentives in “no regrets” opportunities that could serve to boost each city’s competitiveness and sustainability, as we face a climate-defined future.

# BAGUIO CITY

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## CLIMATE / ENVIRONMENTAL EXPOSURE

**As the only inland city on our list, it is unlikely that Baguio City will experience any of the direct coastal impacts of climate change. Baguio sits in a Type 1 Climate zone, with a pronounced wet season from May to October. However, its location in northern Luzon, puts the city well within the Philippine typhoon belt. This clearly establishes that Baguio faces exposure to intensified tropical cyclones and extreme rainfall.**

***El Nino Southern Oscillation (ENSO) events are a meta-scale phenomenon, spanning several large areas of the planet. All four cities in this study will be exposed to recurrences of ENSO in varying degrees.***

Rain is going to be Baguio's bane. At 3914 mm / year, Baguio City already has the highest average rainfall in the Philippines. In 1910, it established a Philippine record for highest annual rainfall at 9006 mm. In 1911, it garnered the world record (at the time) for highest rainfall in 24 hours at 1168 mm. In 1950, it posted another world record for rainfall in 48 hours, at 2009 mm. And more recently, in 2001, Baguio City registered the Philippine record for highest rainfall in 1 hour, 1085 mm. For purposes of comparison, Ondoy released 585 mm of rainfall over Manila in 12 hours.

Over the last 20 years, average annual rainfall in Baguio City, though exhibiting inter-annual variability, has shown an increasing trend from an average of 4673 mm in 1990 to an average of 6137 mm in 2009. The city sits well within the Philippine typhoon belt. It is not surprising that, over the last 20 years, storms have hit Baguio City, almost annually. **Extreme rainfall and intensified tropical cyclones** will continue to define the city's future. It is likely that Baguio will go from wet, to wetter.

There are a number of climate-aggravated effects that Baguio City is exposed to. Aside from being within the path of both heavy rain and storms, Baguio City is criss-crossed by seismic faults. The city sits on a tectonically active area. In an area such as this, rainfall becomes the primary trigger for landslides. These phenomena have long been the scourge of Baguio City. And, with rainfall likely to increase further above current high levels, it is probable that **landslide risk** will also increase. Earthquakes, though not climate related, make Baguio less accessible, and more vulnerable.

Aggravated by the human footprint, **flooding** is another climate-related effect that is likely to continue to plague Baguio City. Originally established on a grassy marshland, as a city for 30,000 people, Baguio City now hosts a

population of more than 300,000 people – on a weekday. This number rises exponentially with the influx of lowland visitors on weekends. Stretched way beyond the original limits it was designed for, Baguio City has allowed extensive land conversion, with its booming population establishing large communities over vast tracks of its hillsides. Now deprived of much of the pine forest that served to recharge Baguio’s aquifers, **groundwater supply** is now grossly inadequate, and **runoff** has regularly flooded the city’s lowest areas such as the City Camp. Of the city’s six watersheds, two have been rendered inoperable due to the unregulated influx of informal settlers. Of the four cities in this study, Baguio City has the highest population density. Unless flooding in the city’s low-lying areas are managed effectively, it is likely that we will see further expansion of communities on the city’s increasingly unstable slopes.

Extensive real estate development in Baguio City has also led to the conversion of forested hills and previously absorptive substrates, to impervious surfaces characteristic of poorly planned urbanization. This impedes water recharge into the city’s natural aquifers and encourages runoff. Baguio City has a serious water problem. This will get worse if Baguio’s population continues to grow at its current rate, and more sustainable solutions for water management are not put in place.

### **Historical Indicators of Climate / Environmental Exposure**

**Precipitation** shows an increasing mean annual trend from 4673 mm in 1990 to 6137 mm in 2010, with high inter-annual variability

**Temperatures** show a decreasing mean annual trend from 19.7 C in 1990 to 19.2 C in 2009.

**Typhoon Threat** remains with near annual storms directly affecting Baguio over the last two decades.

**Flooding** incidents have been reported in low-lying areas such as the City Camp, Burnham Park, Queen of Peace, Lower Lourdes Extension and Lower Rock Quarry.

### **SOCIO – ECONOMIC SENSITIVITY**

<b>Land Area</b>	<b>57.49 sq km</b>
<b>Barangays</b>	<b>129</b>
<b>2010 Population</b>	<b>325,880</b>
<b>2010 Pop Density</b>	<b>5,668 / sq km</b>

**Population** has increased from 182,142 in 1990 to 325,880 in 2010 (NSO) – an increase of 143,738 inhabitants. Population Density has increased from 3,186 / sq km in 1990, to 5,668 / sq km in 2010. Of the four cities in this study, **Baguio City has the highest population density. For the 20-year**

**period, Baguio's average annual population growth rate, at 2.81%, comes a close second only to Davao City.**

**Housing units** have increased from 13,471 in 1990 to an estimated 34,247 in 2010. Concrete houses made up 57% of the total in 1990. By 2010, 84% of all houses were made of concrete.

**Educational Enrollment** has almost doubled, from 88,446 students in 1990 to an estimated 150,814 students in 2010. Tertiary students make up more than 40% of total enrollees.

This data on vegetable production is from Benguet province. Baguio City is an important trading center for produce but it has very little space for agriculture. Total **Annual Vegetable Production**, specifically for cabbage, potatoes, beans, pechay and brocolli has increased by 24.8% over 15 years, from 188,679 MT in 1995 to 235,587 MT in 2010. In contrast, cut flower production has shrunk dramatically from 9,012 metric tons in 1995 to 3,128 metric tons in 2010. Furthermore, the entry of new trading centers in Trinidad have drawn much of the vegetable / flower business away from Baguio City.

**Livestock Production** has shown a steady decline, as well. From a combined tonnage of more than 16,426 MT of pigs, cows and chickens in 1995, this combined tonnage dropped to 3,576 MT in 2010. This drop has been attributed to the entry of much cheaper processed livestock products from the lowlands. Local livestock producers have not been able to compete with these much lower prices. In the matter of livestock, we are seeing the pattern of diminishing food self-sufficiency and increasing dependence on outside sources. A direct effect of urbanization, this echoes the Iloilo experience.

**Tourist Traffic** has remained, by large, domestic. Arrivals over the 20-year period have varied considerably – primarily due to the large earthquake in 1990 and the meninggo virus scare in 2005. Arrivals have varied from a low of 480,898 in 1990, to a post-earthquake peak of 948,894 in 2000, then dropping once again to a low of 608,867 in 2005 due to the virus scare, and recovering only marginally to 735,032 by 2010. This, in spite of the fact that the number of **Tourist Rooms** have risen steadily from a low of 2,994 in 1990, to a high of 4,633 in 2008. Occupancy rates have dropped from a high of 40% in 1990 to a low of 32% in 2010.

In terms of **New Business**, Wholesale and Retail investments have shrunk from 51% of the pie of new investments in 1990, to 24% in 2010. Investments in hotels and lodging have also shrunk by half, from 14% of new investments in 1990 to barely 7% in 2010. In contrast, new Real Estate Development has boomed, from 30% of the pie of new investments in 1990, to 58% in 2010. Population growth is driving new investment.

**Water Supply** remains a serious concern. Utilizing groundwater pumped from the city's six aquifers, a 40% systems loss renders the current supply of 30,000 CMD barely adequate to meet weekday demand of 50,000 CMD. On weekends, this demand increases to 80,000 CMD. In five years, this is

expected to exceed 100,000 CMD on weekends. By 2025, Baguio City will likely have the largest water deficit outside Metro-Manila.

## ADAPTIVE CAPACITY

Local Governance Performance Monitoring System (LGPMS)

A Self Evaluation by the City Government

Areas of Governance	Baguio City		
	2009	2010	Difference (2010 and 2009)
<b>Administrative Governance</b>			
Local Legislation	3.70	3.42	(0.28)
Development Planning	4.91	4.84	(0.07)
Revenue Generation	4.67	4.67	-
Resource Allocation and Utilization	3.48	4.21	0.73
Customer Service - Civil Applications	4.40	5.00	0.60
Human Resources Management and Development	5.00	5.00	-
<b>Economic Governance</b>			
Support to Agriculture	N/R	N/R	
Support to Fishery Services	N/R	N/R	
Entrepreneurship, Business and Industry Promotion	3.88	3.36	(0.52)
<b>Social Governance</b>			
Health Services	4.68	5.00	0.32
Support to Education Services	4.90	4.80	(0.10)
Support to Housing and Basic Facilities	2.60	1.80	(0.80)
Peace, Security and Disaster Risk Management	4.67	4.67	-
<b>Environmental Governance</b>			
Forest Ecosystem Management	5.00	4.67	(0.33)
Freshwater Ecosystems Management	N/R	N/R	
Coastal and Marine Ecosystems Management	N/R	N/R	
Urban Ecosystems Management	4.38	4.38	-
<b>Valuing Fundamentals of Governance</b>			
Participation	5.00	5.00	-
Transparency	5.00	4.73	(0.27)
Financial Accountability	4.59	4.92	0.33

A self-rating of 5.00 is a perfect score. The Baguio City government gave itself “excellent” ratings in 4 out of 16 criteria that make up the LGPM score sheet, or an **average score of 4.40 for 2010**.

*It did not submit self-ratings for four items on the checklist: Support to Agriculture, Support to Fishery Services, Freshwater Ecosystems Management and Coastal & Marine Ecosystems Management.*

**CRIME SOLUTION EFFICIENCY** from July 2010 to June 2011 was reported at 10.35%. In his State of the City address in July 2011, Mayor Mauricio Domogan of Baguio City reported that this score was a 7.2% improvement over the preceding period. For these 12 months, a total of 4,263 index crimes were committed. In proportion to the city’s 2010 population, **this translates to 1,308 index crimes per 100,000 people**. Of the four cities covered by this study, Baguio City has the second highest record of index crimes per 100,000 people, and the second lowest CSE score.

Baguio's **Work Force** has shown dramatic growth, from 80,267 in 1990 to an estimated 222,020 in 2010. There has been some minor shifting between occupations. In terms of Occupational Group, the percentage made up of Professionals, OFWs and Government Staff has increased slightly from 25% of total work force in 1990 to 33% in 2010. In contrast, the groups classified as Non-Professionals and Others, has diminished from 75% to 67%.

**Functional Literacy** for the Cordillera Administrative Region has shown steady increases, from 85.4% in 2004 to 89.2% in 2008. This Region has the **highest FL scores** among the four areas studied.

**Family Incomes** have increased and savings have shown **dramatic increases** from average annual incomes of P98,907 with savings of P15,812 per family in 1990, to an estimated average annual income of P495,180 with savings of P142,004 per family in 2010. Family Savings as a percentage of Income, has shown an increase from 16% in 1990 to almost 29% in 2010.

**City Revenues** registered at P922.8 Million in 2008, and after deducting Expenditures, ended the year with Reserves of P139.1 Million. Broken down, this translates to Reserves of P449 per capita. It may be worthwhile to note that Reserves were P950 per capita in 2004.

In 2010, the 59 banking offices in Baguio City reported **325,770** active accounts representing a deposit value of **P32.86 Billion** – with an average deposit value of **P100,868**.

Benguet Province, where Baguio City is located, registered a **Human Development Index value of 0.787 in 2006**, an improvement from 0.743 in 2003. Of the four locations covered in this assessment, **Benguet Province scored the highest on this indicator**.

## LIST OF DEVELOPMENT DRIVERS

**Primary Driver POLITICS & GOVERNANCE**

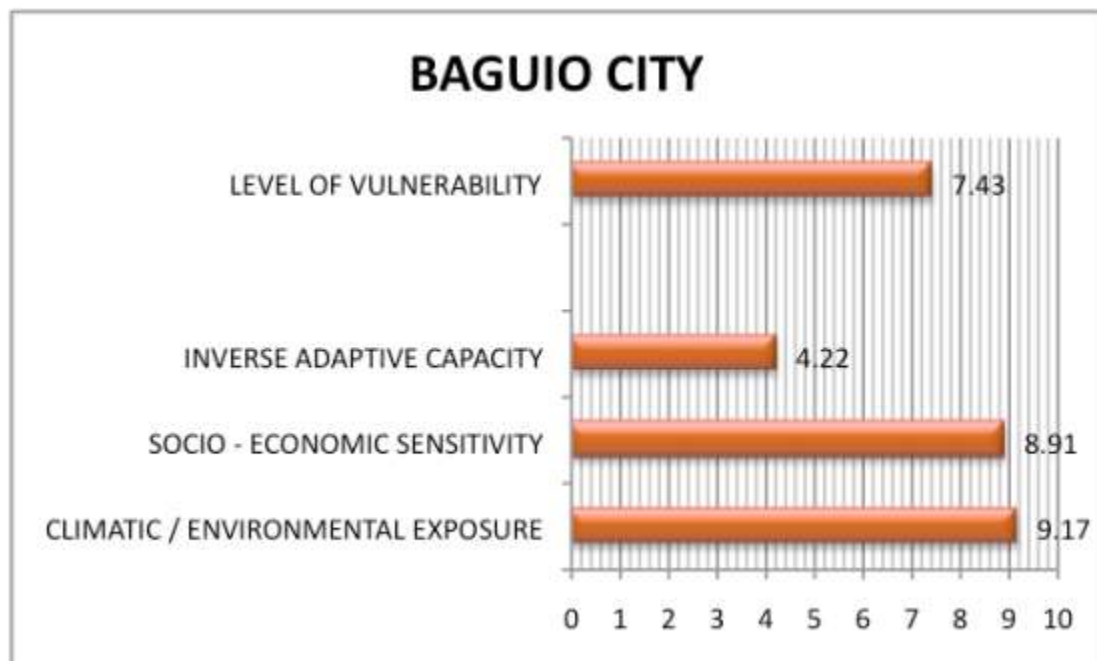
**Secondary Drivers INFRASTRUCTURE  
PLANNING**

Additional Drivers ATTITUDE  
YOUTH  
TOURISM  
POPULATION  
HEALTH  
EDUCATION  
AGRICULTURE  
TECHNOLOGY

## SCENARIOS DEVELOPED

Best case: People Oriented Governance / Sufficient Infrastructure  
Mid case A: People Oriented Governance / Insufficient Infrastructure  
Mid case B: Self-oriented Governance / Sufficient Infrastructure  
Worst case: Self-oriented governance / Insufficient infrastructure

## ASSESSMENT & INTEGRATION



**At barely 57 square kilometers, Baguio City is the smallest, and most densely populated, city covered by this study. In the scoring process, it also emerged as the most vulnerable to climate change impacts.**

**All historical records confirm that Baguio City has the highest rainfall in the country, and climate trends indicate that this is likely to get worse. From a climate point of view, the management of urbanization trends and watersheds as well as Baguio's population growth, will play major roles in defining the continued viability of this city's economy.**

**Baguio City does not have a commercial air link. Its only economic umbilical is confined to land access. Surprisingly, its current top development drivers are real estate development, agricultural production and educational enrollment – all of which depend greatly on new land, appropriate infrastructure and reliable land access via well-**

**maintained mountain roads. Currently, none of these appear to measure up to Baguio's future needs.**

**Although tourism arrivals remain rather robust, they have not shown a steady growth trend. Baguio is far outstripped by Cebu as a banner destination. Furthermore, its relatively low and declining hotel occupancy rates do not bode well for the city's tourism sector. New investments in tourism have diminished dramatically. Unless something significant happens, tourism seems to be fading away from center stage. The city's economic dependence on land transportation, through routes made frequently inoperable by landslides due to rainfall, will emerge as one of Baguio's most significant development challenges, as intensified precipitation and storms assault and increasingly marginalize these essential economic lifelines.**

**In the scenario building exercises formulated by Baguio's own stakeholders, Governance, Infrastructure and Planning were selected as the three top development drivers likely to exert a strong influence on the city's future. There is no doubt that Baguio City has expanded way beyond its carrying capacity.**

**Baguio City's strength lies in its population. Among the four cities, Baguio logged the highest scores, both in Human Development Index and in Functional Literacy. Although probably under-utilized, this asset was flagged by local stakeholders in one scenario. They pictured a city where good things can happen. Though saddled with insufficient infrastructure, that scenario underscored that people-oriented governance, enhanced by Baguio's wealth of human capital and public-private synergies, could make negative elements turn positive. The city's opportunity is to look beyond its boundaries, beyond BLIST, identify its unique competences, then craft a "climate smart" long-term development plan that defines a regional role for the city within CAR and Region 1. If it is to take the city away from the edge of this climate precipice, all efforts should be made to pursue development of a multi-year plan through a participatory process. This program should be doggedly implemented beyond any single political leader or term, in order to establish new, durable foundations for the city's economic resurgence. If the businesses of Baguio City hope to remain competitive and viable, they should focus on striking a sustainable balance between local ambition, demographic facts and the emerging realities of climate change.**

# CEBU CITY

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## CLIMATE / ENVIRONMENTAL EXPOSURE

**Like Iloilo, Cebu City will be exposed to all six climate scenarios listed in the WWF study. It is the only city on this list situated in a Type 2 Climate zone, with a relatively pronounced wet season from June to early January. Its location, in the central Visayas, between the wet / typhoon prone and dry / hot belts of the Philippines, points to the likelihood that its rainfall challenge will have to do with high variability and a difficulty of prediction, rather than a pronounced increase or decrease of rainfall.**

***ENSO events are a meta-scale phenomenon, spanning several large areas of the planet. All four cities in this study will be exposed to recurrences of ENSO in varying degrees.***

The oldest city in the Philippines, Cebu City sits on a narrow littoral along the eastern coast of Cebu Island's waist. Characterized by narrow coastal plains with rugged mountains and limestone plateaus, barely 15% of the city's total land area sits on flat terrain. With so much of its land area on steep slopes, Cebu City is not an agricultural center. Its uplands are also highly **vulnerable to landslides** from rainfall.

Cebu City is hemmed in by water on three sides. It faces the Mactan Channel in the east, bound by the Subangdaku River in the north, and the Bulacao River in the south. As in the case of Iloilo City, the analysis of rainfall in Cebu City over the last twenty years indicates there has been no significant change in mean rainfall. However, like Iloilo City, it is already evident that Cebu City's climate patterns indicate **high inter-annual variability**, with **extreme weather events** at both ends of the wet-dry spectrum. Like Iloilo, Cebu residents have begun to notice an increased incidence of flooding within certain portions of the city.

Cebu City sits at the lower edge of the typhoon belt. Although storms do not hit this portion of the archipelago with as high a frequency as Luzon, historical data indicates that the city remains vulnerable at certain times of the year. The storms that hit the Cebu are also known to come at a time of year, i.e. November and December, when cyclones can be rather fierce.

Although the city reports that it sits 18 meters above sea level, several districts of the old city are barely 1 to 2 meters ASL. This includes the neighboring island of Mactan where the province's only commercial airport is located. **Saltwater intrusion**, due to excessive groundwater extraction, has long been a problem here. Relatively recent studies indicate that saltwater intrusion has been reported 5 kilometers inshore. With such a large portion of

the city located on slopes inhospitable to agriculture and settlement, Cebu City will likely find itself caught in a “climate sandwich” as **saltwater intrusion** advances further, **sea levels rise** and more **intense typhoons** lash the coastline with **storm surge**.

The fisheries of Cebu have long exceeded maximum sustainable yields. This fact has not diminished the city’s value as a regional center for marine products because its main strengths are processing and distribution. However, as **sea surface temperatures increase** and **ocean acidification** advances, the city’s supply chains, that source marine products from viable fisheries around the Region, may begin to strain. **Inter-annual variability** and increased consumption fueled by population growth, will only add to this management challenge.

### **Historical Indicators of Climate / Environmental Exposure**

**Precipitation** in Cebu City has remained statistically constant over the last 20 years at a mean annual level of 1,614 mm. A closer look at the same data reveals, however, **high inter-annual variability**.

**Landslides** due to Precipitation pose a high threat for 24% and a moderate threat for 16% of Cebu City’s barangays.

**Typhoon Threat**, though present, remains lower than Iloilo City. Over the last 20 years, 21 tropical depressions or storms have crossed Cebu, with 56% of them taking place in the months of November and December.

**Flooding** is a high threat for 6 barangays and a moderate threat for 18 barangays of Cebu City. This represents 8% and 22% of all barangays, respectively.

## **SOCIO – ECONOMIC SENSITIVITY**

<b>Land Area</b>	<b>320.10 sq km</b>
<b>Barangays</b>	<b>80</b>
<b>2010 Population</b>	<b>841,927</b>
<b>2010 Pop Density</b>	<b>2,630 / sq km</b>

**Land Area** records indicate that Cebu City “expanded” from 284.9 sq km in 1990 to 320.1 sq km in 2010.

**Population** in Cebu City has grown from 610,417 in 1990 to 841,927 in 2010 – an increase of 231,510 inhabitants. Population Density has increased from 1,907 / sq km in 1990, to an estimated 2,630 / sq km in 2010. Cebu City registered the **lowest population growth rate of the four cities in this study, at 1.41% over the 20-year period**.

Next to Metro-Manila, Cebu City is the **second-largest center of business** in the country. **Business Establishments** have increased by six times, over

the last 15 years, from 536 in 1995 to 3,165 in 2010. The greatest single growth sector is made up of Service Contractors. Following a distant second is the sector made up of Distributors, Retailers and Wholesalers. These sectors now account for almost three fourths of employment within the city.

**Shipping** is, without doubt, the jewel in Cebu's crown. Over the last two decades, Annual Inbound Volume has increased 7 times from 0.65 Million MT in 1990 to 5.4 Million MT in 2010. Over the same period, Annual Outbound Volume has increased 4 times from 0.76 Million MT in 1990 to 4 Million MT in 2010. Annual Inbound Foreign Cargo Traffic has increased 170% in ten years, from 0.82 Million MT in 2000 to 2.12 Million MT in 2010. Annual Outbound Foreign Cargo Traffic has increased 184% in ten years, from 0.32 Million MT in 2000 to 0.89 Million MT in 2010. In terms of passenger traffic, sea-borne passenger traffic has only increased marginally. This reflects the same experience as Iloilo City. These figures indicate that, as far as shipping is concerned, Cebu City is in the business of cargo, rather than passengers. And the greater bulk of its shipping business remains domestic, rather than international. They also indicate that Cebu City's shipping business is more focused on inbound rather than outbound cargo.

Despite this, Cebu City has delivered strong growth figures for **Foreign Trade** exports and imports. From \$396 Million in 1990, Cebu City's foreign trade exports exceeded \$1.527 Billion in 2008 – 3.85 times in 20 years. For imports, the city delivered growth from \$214 Million in 1990 to \$1.260 Billion in 2010 – 5.88 times in 20 years. Among the four cities studied, it remains on top in terms of Foreign Trade.

Like Baguio and Iloilo, Cebu City has encouraged investment in **Tourism** as evidenced by a concerted effort to increase its number of hotel rooms. Over five years, the city's hotel room count has mushroomed from 2,864 rooms in 2005 to 4,126 rooms in 2010. **Tourism Arrivals**, 60% of which are domestic, increased by 58% over five years, from 1.12 Million in 2005 to **1.76 Million in 2010**. Even if Cebu City's hotel occupancy rates have lingered at the lackluster 50% to 54% levels, of the four cities covered by this study, it is clearly the leader.

There is data pointing to the possibility that **Land Classification and Protected Areas** within Cebu City do not comply with generally applied national guidelines for land use. Under Philippine law, only lands with a slope of 18% or less can be classified as alienable/disposable, i.e., areas where human settlements and cultivation of land are allowed. Other lands are to remain as forest or set aside for other special uses.

Only 28 % of Cebu City's land area falls within the range acceptable for human settlement or cultivation. It is a matter of concern, therefore, that about 64% of city lands are classified by the national government as alienable and disposable. 23 of the city's 80 barangays are totally or partially located in four watershed areas. In fact, some lands, classified as timberland, include areas that fall within critical watersheds and other protected areas of the city, such as the Central Cebu Protected Landscape (CCPL). Seeing that water

supply is widely recognized as one of Cebu's chief challenges, this is a glaring socio-economic sensitivity that calls for resolution.

## ADAPTIVE CAPACITY

Local Governance Performance Monitoring System (LGPM)  
A Self Evaluation by the City Government

Areas of Governance	Cebu City		
	2009	2010	Difference
<b>Administrative Governance</b>			
Local Legislation	4.64	4.64	-
Development Planning	4.91	3.63	(1.28)
Revenue Generation	5.00	4.00	(1.00)
Resource Allocation and Utilization	2.92	3.92	1.00
Customer Service - Civil Applications	4.80	4.80	-
Human Resources Management and Development	5.00	5.00	-
<b>Economic Governance</b>			
Support to Agriculture	4.24	4.24	-
Support to Fishery Services	4.45	4.45	-
Entrepreneurship, Business and Industry Promotion	4.50	4.50	-
<b>Social Governance</b>			
Health Services	5.00	5.00	-
Support to Education Services	5.00	5.00	-
Support to Housing and Basic Facilities	4.00	4.00	-
Peace, Security and Disaster Risk Management	4.80	4.83	0.03
<b>Environmental Governance</b>			
Forest Ecosystem Management	5.00	5.00	-
Freshwater Ecosystems Management	5.00	5.00	-
Coastal and Marine Ecosystems Management	5.00	5.00	-
Urban Ecosystems Management	4.63	4.63	-
<b>Valuing Fundamentals of Governance</b>			
Participation	5.00	5.00	-
Transparency	5.00	5.00	-
Financial Accountability	4.92	4.92	-

A self-rating of 5.00 is a perfect score. The Cebu City government gave itself "excellent" ratings in 8 out of 20 criteria that make up the LGPM score sheet, or an **average score of 4.63 for 2010**.

**Crime Solution Efficiency** for Cebu City was reported at 21% for the first 1<sup>st</sup> Semester of 2010, with 3,291 index crimes reported for that same six-month period. In proportion to the city's 2010 population, this translates to 390 index crimes per 100,000 people – over a six-month period. All other cities reported comparative crime statistics over a 12-month period. PNP 7 reported an improvement in CSE for the 1<sup>st</sup> Semester of 2011, with a 32% solution rate.

**Functional Literacy** in Region 7 logged a score of 86.6% in 2008, an improvement from 81.7% in 2003.

**City Revenues** registered at P2.96 Billion in 2008, and after deducting Expenditures, ended the year with Reserves of P1.18 Billion. Broken down, this translates to Reserves of P1451 per capita. Of the four cities, these are the highest year-end reserves per capita for 2008.

In 2010, the 204 banking offices in Cebu City reported **926,374** active accounts representing a deposit value of **P168.0 Billion** – with an average deposit value of **P181,352**, the highest of all four cities.

Cebu Province, where Cebu City is located, registered a **Human Development Index value of 0.618 in 2006**, an improvement from 0.608 in 2003. Of the four locations covered in this assessment, **Cebu Province scored the lowest on this indicator.**

## LIST OF DEVELOPMENT DRIVERS

**Primary Driver GOOD GOVERNANCE & POLITICAL WILL**

**Secondary Driver WATER RESOURCE MANAGEMENT**

Additional Drivers POPULATION  
LAND & WATERSHED MANAGEMENT  
BUSINESS  
PLANNING  
EDUCATION  
STRATEGIC LOCATION  
INFRASTRUCTURE  
ENERGY & TECHNOLOGY.

## SCENARIOS DEVELOPED

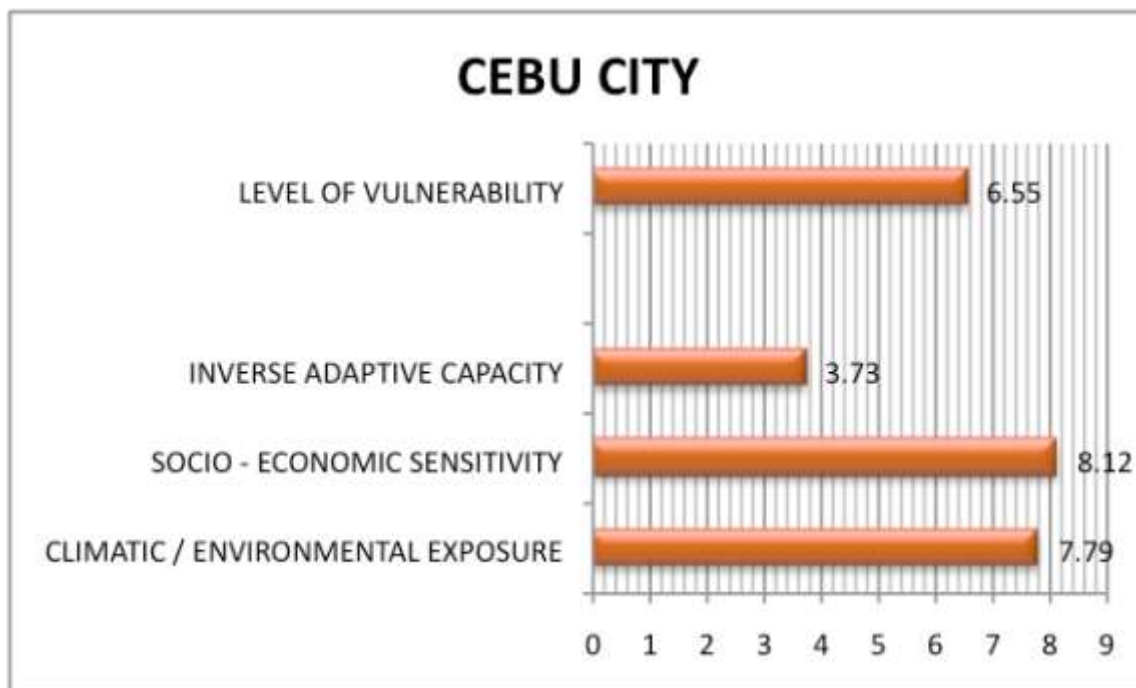
Best case: Pro-active Governance / Sustainable Equitable Water

Mid case A: Pro-active Governance / Disaster

Mid case B: Unsupportive Governance / Sustainable Equitable Water

Worst case: Unsupportive Governance / Disaster

## ASSESSMENT & INTEGRATION



Manufacturing, processing and trade are Cebu City's economic lifeblood. It remains the Queen City of the South. This requires extremely reliable infrastructure, efficient land / sea access and cost-competitive utilities, particularly water supply. Over the last 20 years, Cebu City delivered phenomenal growth in both sea-borne cargo and foreign trade receipts. Of the four cities studied, it remains on top in these two categories. To sustain this, however, Cebu must make the decision now, to re-invent itself. It is the best time to re-think, re-work and re-tool. In terms of vulnerability, Cebu City ranked number three, overall. As weather events become more extreme and frequent, Cebu City may find itself increasingly affected by business disruption borne of supply chain issues and workforce dislocation. Among the four cities, Cebu reported the highest year-end reserves per capita, as well as the highest average deposit value. It emerged as the best financially-resourced city to make new investments in re-engineering.

In the scenario building exercises formulated by Cebu's own business stakeholders, they identified Governance and Water Resources Management as the two top development drivers likely to exert a strong influence on the city's future. Cebu's opportunity is to invest in maintaining competent leadership as well as sustainable and cost-effective utilities. These are the economic "nuts and bolts" that must be in place for centers of processing and trade, such as Cebu City.

**Government cannot do this alone. In one scenario, “public-private partnerships” were pinpointed as a success variable, as were “business friendly policies and regulations”.**

**In an effort to improve efficiencies and achieve economies of scale, Cebu City has opted to adopt the concentration of business activity as its development model. This also translates to a concentration of climate risk. Unlike Panay, for example, the island of Cebu has no commercial air facility. Their commercial airport sits on Mactan – a highly porous limestone island that practically sits at sea level. If it can be paid for, redundancy in the matter of commercial air links, is a critical “no regrets” option for Cebuanos. If it is to remain competitive, the province of Cebu should consider investing in a second airport. Efforts should also be encouraged toward updating Cebu City’s rapidly aging fleet of ships and port facilities. The best strategic location diminishes in value, without ready and affordable access.**

**Of the four cities covered, although Cebu scored rather well on Functional Literacy, it still ranked the lowest on the Human Development Index. No factory, facility or organization can be expected to operate optimally if its workforce does not receive the benefits that are available elsewhere, or enjoy general well-being. In parallel to infrastructure, equipment and technology, the businesses of Cebu City should consider investing in the elements that make up HDI, i.e., life expectancy, literacy, education and standards of living. As both foreign and local markets move closer and closer toward implementing standard measures of corporate sustainability, all processing and trading centers will have to step up to the plate. Human capital is an adaptive strength that Cebu City needs to build up.**

**Cebu City’s opportunity lies in a long-term plan and development model that will disperse and diffuse climate risk. One scenario flagged “united political leadership” as a key element, along with “effective, efficient, responsible and transparent governance”. Cebu will require new investments in “climate smart” infrastructure and technology. It will also require a re-thinking of what it will take to build human capital, improve the well-being of Cebu’s workforce, and keep them at the cutting edge. If Cebu City looks “beyond its fences” and forges new development directions leading to global integration in this climate-defined future, it may seize this opportunity to strengthen its economic supply chains within the Region, and maintain its reputation as a center for cost-competitiveness and reliability as a processor or supplier of goods and services.**

# DAVAO CITY

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## CLIMATE / ENVIRONMENTAL EXPOSURE

**Davao City is the only city on this list that sits in a Type 4 Climate zone, with relatively even year-round rainfall. It does not experience typhoons. As a coastal city in this typhoon-free portion of Mindanao, the city's future will likely involve only 5 of the 6 climate scenarios listed in the WWF study.**

***ENSO events are a meta-scale phenomenon, spanning several large areas of the planet. All four cities in this study will be exposed to recurrences of ENSO in varying degrees.***

Sitting at the southern coastline of Mindanao on coastal plains and valleys extending inland, Davao City sits in a typhoon-free zone. The Manila Observatory climate maps show, that this an area likely to experience increasingly dry and hot weather over the next 50 years. This is the only city of the four in this study that is projected to have an increase in temperature coupled with pronounced periods of decreased rainfall. Recent PAGASA data, however, still does not show such a trend.

Over the last 20 years, rainfall data from PAGASA (covering two or three El Nino episodes) shows a moderately increasing trend for mean annual rainfall – from 1685 mm+ to 1806 mm. Very recently, Davao City has had to deal with extreme rainfall events that have spawned dangerous floods in parts of the city – particularly in areas adjacent to the city's rivers.

Several rivers run through the city, draining into the Davao Gulf. The largest of these watercourses are the Davao and Talomo Rivers. Recent incidents of heavy rain have also given rise to rat infestation in the city's agricultural areas. Unless and until this rainfall trend reverses itself, it is likely that Davao's growing economy will have to manage **increased rainfall**, river flow and flooding.

Davao Gulf is a known center for marine biodiversity. Like Iloilo, Davao City is a hub for both wild-caught fisheries and aquaculture. **Rising sea surface temperatures** and **ocean acidification** are likely to lead to marginalization of coral reefs and sea grass beds, spawning adverse effects for this sector. Increased rainfall and sparse forest cover in Davao's uplands constantly feeds **expansive plumes of sedimentation and pollution** that blanket Davao Gulf's coastal zones. This constant aggravation further diminishes the Gulf's resilience and ability to rebound from high temperature episodes or spikes of acidification.

**Sea level rise** may create problems for Davao City's ports. Located along the relatively shallow channel between the city and Samal Island, these port

facilities are a nerve center for Davao City's economy, and serve a variety of ships handling both cargo and passengers. Davao has traditionally tapped surface water from its rivers as its main water source. It prides itself in the relatively high quality of its drinking water. However, saltwater intrusion has already been reported in city districts close to shore, especially in portions of the city where groundwater extraction continues. Sea level rise may aggravate this situation.

### **Historical Indicators of Climate / Environmental Exposure**

**Precipitation** in Davao City has shown an upward trend, average annual rainfall increased by 10%, from 1,685 mm in 1990 to 1,806 mm in 2010 (PAGASA).

**Temperature** has shown a slight increase, as well, from 27.9 C in 1990 to 28.48 C in 2010.

**Typhoon Threat** remains nil.

**Flooding** is a recent but recurring phenomenon, due in part to incidents of extreme rainfall in the uplands of the city.

### **SOCIO – ECONOMIC SENSITIVITY**

<b>Land Area</b>	<b>2443.61 sq km</b>
<b>Barangays</b>	<b>182</b>
<b>2010 Population</b>	<b>1,542,425</b>
<b>2010 Pop Density</b>	<b>631 / sq km</b>

**Population** in Davao City has grown from 850,316 in 1990 to 1,542,425 in 2010 – an increase of 692,109 inhabitants. Population Density has increased from 348 / sq km in 1990, to an estimated 631 / sq km in 2010. Although Davao City enjoys the lowest population density of the four cities in this study, it also shows the **highest average population growth rate at 2.88%, and the highest number of new inhabitants over the 20-year period.**

In parallel with the city's population growth and expansion, the number of **Motor Vehicles** here has exploded by 3.5 times, from 37,378 vehicles in 1990, to 136,283 motor vehicles in 2010. Barring inner city re-development, better traffic management and an improved road network, road congestion and degraded air quality could be a matter for concern.

**Agriculture** is Davao's largest economic sector with banana, pineapple, durian, mango and papaya as the top five fruit crops in 2010. **Durian** showed the most significant increase in terms of fruit crop production from 3,856 MT in 1990 to 36,822 MT in 2010 – an 855% increase. **Banana** production – **the sectoral leader in tonnage - more than doubled** over 20 years, from 107,932 MT in 1990 to 227,651 MT in 2010. Over the same period, Mango

output increased by only 10%, while Papaya production grew by 30%. Pineapple production dropped by 4%, from 22,502 MT in 1990, down to 21,591 MT in 2010.

In cereals, **Corn production** delivered a robust pattern of growth, more than doubling from 9,837 MT in 1990, up to 20,880 MT in 2010. Areas planted to corn only increased by 15% during that 20-year period. It was in corn yield per hectare where Davao City showed an 84% improvement from 1.03 MT/hectare in 1990, up to 1.91 MT/hectare in 2010. In contrast, **Palay production decreased by nearly 50%**, from 27,337 metric tons in 1990, down to 14,198 metric tons in 2010. This, in spite of an increase in the proportion of irrigated rice land from 47% in 1990 to 52% in 2010; and an improvement in rice yield per hectare from 2.83 MT in 1990 to 3.41 MT in 2010.

In the matter of animal protein, **swine/ hog production decreased** slightly by 3 per cent over the last fifteen years, from a total of 246,380 heads in 1995, down to 238,770 in 2010. In contrast, the **production of poultry increased** by 13% from 2.881 Million heads in 1995 to 3.258 Million heads in 2010.

As in the case of Cebu, **Foreign Trade** trends in Davao have been overwhelmingly positive. Imports increased from \$279 Million in 1990 to \$1.194 B in 2010 – 4.27 times over 20 years. Exports increased from \$55 M in 1990 to \$713 M in 2010 – 12.96 times over 20 years. Although imports into Davao continue to exceed exports, and the spurt in export values happened only over the last five years, Davao City's rate of increase in Foreign Trade receipts far exceeds the figures delivered by Cebu.

**Shipping and sea-based transport** remain a significant growth driver. The volume of cargo discharged and loaded at the city's ports increased from 5.4 Million MT in 1995 to 8.69 Million MT in 2009 - a 61% increase over 15 years. In comparison with Cebu's figures, however, this increase in tonnage shipped from Davao is not as dramatic. Sea-based passengers increased three fold, from 248,542 in 1995 to 809,586 passengers in 2009. Shipping is as important to the Davao City economy as it is to Cebu.

**Tourism** has shown robust growth, as well. With local / domestic arrivals taking a little more than 90% of the pie, tourist arrivals nearly tripled from 173,298 in 1990 to **682,821 in 2010**. Significant growth took place over the last ten years. In 2010, the total estimated tourist receipts hit P9.55 Billion, based on a 3.5 days average length of stay and an average expenditure of P4,000 per day/tourist.

Over the last five years, the **number of business establishments** registered with the Business Bureau of the Davao City Government increased by 33%, from 24,611 in 2006 to 32,691 in 2010. Capitalization has grown by 70 per cent from P108.96 Billion in 2006 to P184 Billion in 2010.

**Educational Enrollment** has increased over the 20-year period. Elementary level enrollment almost doubled from 133,324 in 1990 to 216,967 in 2010. High School enrollment also increased from 65,637 in 1990 to 98,380 in 2010.

## ADAPTIVE CAPACITY

Local Governance Performance Monitoring System (LGPMS)  
A Self Evaluation by the City Government

Areas of Governance	Davao City		
	2009	2010	Difference
<b>Administrative Governance</b>			
Local Legislation	4.75	4.56	(0.19)
Development Planning	4.91	4.91	-
Revenue Generation	4.00	4.00	-
Resource Allocation and Utilization	5.00	5.00	-
Customer Service - Civil Applications	5.00	5.00	-
Human Resources Management and Development	5.00	5.00	-
<b>Economic Governance</b>			
Support to Agriculture	4.90	3.71	(1.19)
Support to Fishery Services	4.90	4.75	(0.15)
Entrepreneurship, Business and Industry Promotion	4.67	4.50	(0.17)
<b>Social Governance</b>			
Health Services	5.00	4.87	(0.13)
Support to Education Services	5.00	5.00	-
Support to Housing and Basic Facilities	5.00	4.00	(1.00)
Peace, Security and Disaster Risk Management	4.83	5.00	0.17
<b>Environmental Governance</b>			
Forest Ecosystem Management	5.00	5.00	-
Freshwater Ecosystems Management	5.00	5.00	-
Coastal and Marine Ecosystems Management	5.00	5.00	-
Urban Ecosystems Management	4.75	4.63	(0.12)
<b>Valuing Fundamentals of Governance</b>			
Participation	5.00	5.00	-
Transparency	5.00	5.00	-
Financial Accountability	5.00	5.00	-

A self-rating of 5.00 is a perfect score. The Davao City government gave itself “excellent” ratings in 11 out of 18 criteria that make up the LGPM score sheet, or an **average score of 4.75 for 2010**. This represents the highest rating given by a local government to itself.

**CRIME SOLUTION EFFICIENCY** from July 2010 to June 2011 was reported at 57.6 %. Of the four cities covered by this study, Davao City delivered the **highest CSE score**. In her State of City address in September 2011, Mayor Sara Duterte of Davao City reported that this relatively high score was attained through the adoption of an Anti-Crime Incentive Program for police officers, an integrated patrol plan and more cooperation from witnesses. 6,623 index crimes were reported for the period. In proportion to the city’s 2010 population, this translates to **429 index crimes per 100,000 people/year**. Of the four cities covered by this study, Davao City delivered **lowest index crime rate**.

**Davao City’s labor pool** has grown dramatically over the last 15 years. From 434,000 in 1995, the city’s work force has expanded to 1,851,000 individuals in 2009. Unemployment rates in the city have dropped from 8.3%

in 1995 to 6% in 2009. It is revealing that the city's workforce is significantly higher than its own population.

**Functional Literacy** in Region 11 has improved from 77.8% in 2003 to 82.6% in 2008.

The Peso value of **Family Incomes / Savings** have increased from average annual incomes of P51,823 with savings of P9,851 in 1990, to incomes of P155,937 with savings of P29,565 in 2010. Family Savings as a percentage of Income, however, remains relatively constant at the 19% level.

**City Revenues** registered at P3.33 Billion in 2008, and after deducting Expenditures, ended the year with Reserves of P203.46 Million. Broken down, this translates to Reserves of only P139 per capita – the lowest of all four cities. With Davao's high and expanding population, this is no surprise.

In 2010, the 171 banking offices in Davao City reported **757,800** active accounts representing a deposit value of **P85.67 Billion** – with an average deposit value of **P113,050**.

Davao del Sur Province, where Davao City is located, registered a **Human Development Index value of 0.645 in 2006**, an improvement from 0.624 in 2003. Of the four locations covered in this assessment, **Davao del Sur Province ranked #3 for this indicator**.

## DRIVERS IDENTIFIED / SCENARIOS DEVELOPED

**Primary Driver GOVERNANCE**

**Secondary Driver AGRICULTURE**

Additional Drivers

- CULTURAL FACTORS
- IT TECHNOLOGY
- ENVIRONMENTAL HEALTH
- EDUCATION
- BUSINESS
- R&D
- POPULATION
- WELL BEING.

## SCENARIOS DEVELOPED

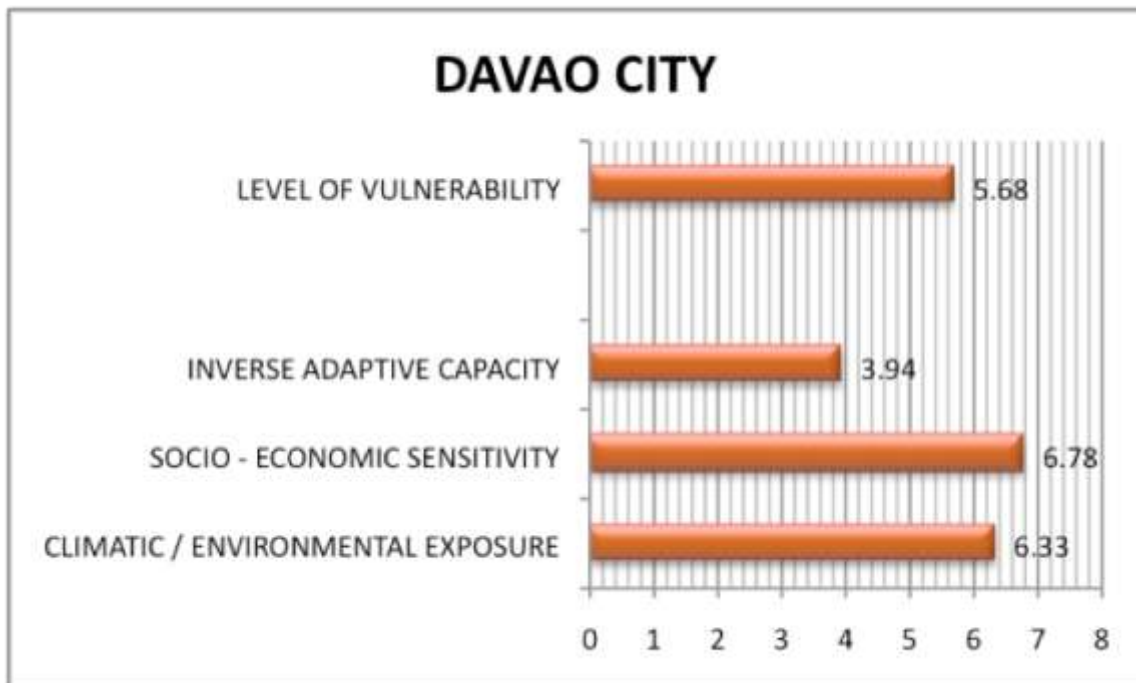
Best case: People Oriented Governance / Democratized Agriculture

Mid case A: People Oriented Governance / No Agriculture

Mid case B: Power Oriented Governance / Democratized Agriculture

Worst case: Power Oriented Governance / No Agriculture

## ASSESSMENT & INTEGRATION



In terms of land area, Davao is the largest of the four cities in this study. It is no surprise that it has the lowest population density. It has no typhoons. It is the gateway to BIMP-EAGA. And, there is room for sustainable, integrated area development. These are its advantages. In a climate-defined future, these are also its challenges.

It is likely that Davao City will have to deal with climate impacts such as sea level rise, increased sea surface temperatures, ocean acidification, and inter-annual variability of rainfall. It is also likely that Davao will emerge as a site of refuge for an increasing number of migrants. There are indications that this trend has already begun. Over 20 years, Davao logged more than 692,000 new inhabitants – the highest number of all four cities. It also registered the highest population growth rate, at 2.88%. This may be one reason why, in spite of the fact that Davao showed the highest revenues of all four cities, it also ended up the year with the lowest reserves per capita.

Davao City still has significant land area to build new, more livable satellite developments. In this assessment, it emerged as the least vulnerable city, overall. Its opportunity is to do things the right way. In parallel with the intensification of climate impacts, the commercial /

residential centers of Davao City will expand, and it is likely that the city will move further and further away from its traditional role as a major center for industrial-scale agriculture. New opportunities for sustainable development will present themselves in the form of effective and sustained management of essential utilities, i.e., water and power, as well as basic services, food security driven by innovative agricultural formulas, “climate smart” zoning, mass transit, land use and infrastructure, as well as efficient land / sea access to centers of development in Mindanao, and throughout the Philippines.

In the scenario building exercises formulated by Davao’s own stakeholders, they identified Governance and Agriculture as the two top development drivers likely to exert a strong influence on the city’s future. In the matter of Governance, Davao City delivered top marks on its LGPM Score, Crime Solution Efficiency, as well as the lowest number of index crimes per 100,000 people. The key challenge that faces Davao’s voters is how to maintain this over the decades ahead. This key variable was underscored in virtually all scenarios developed. In the matter of Agriculture, although Davao has delivered impressive growth in commercial-scale produce such as banana, durian and corn; its production of rice dropped by 50%. This is a matter of concern. People still have to eat. And, as more than one scenario pointed out, as Davao’s population continues to grow in leaps and bounds, equitable but productive formulas will have to be developed vis-à-vis agricultural production and land use. Although Davao runs a close second to Cebu in terms of tonnage shipped through its port, it delivered the better growth rate, in terms of foreign trade receipts. Davao has found its place in the sun. Like Cebu, therefore, the businesses of Davao should take a close look at the city’s shipping fleet and port facilities, and take the necessary steps to ensure that they are upgraded to deal with the impacts of climate change.

For Davao City, high population growth and in-migration underscores that strategic development decisions must be made now. More than that, a multi-stakeholder formula for continuity must be set in place if this city is to sustain and re-engineer its agricultural strengths, and avoid the disorganized congestion that characterizes many other cities, emerging as a new center for livability and competitiveness in a climate-defined world.

# ILOILO CITY

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## CLIMATE / ENVIRONMENTAL EXPOSURE

**Iloilo City, like Cebu, will be exposed to all six climate scenarios listed in the WWF study. Like Baguio, it sits in a Type 1 Climate zone, with a pronounced wet season from May to early December. Its location, between the wet / typhoon prone and dry / hot belts of the archipelago, may point to the likelihood that it will have to deal with high rainfall variability, rather than a pronounced rainfall increase or decrease.**

***ENSO events are a meta-scale phenomenon, spanning several large areas of the planet. All four cities in this study will be exposed to recurrences of ENSO in varying degrees.***

Sitting on a flat alluvial plain, Iloilo City is perched at the edge of the largest marshland in the Western Visayas. With a geography that is typical of coastal marshes and mangrove forests, four water courses provide the city with natural drainage: the Iloilo River, the Batiano River, the Jaro River and Dungon Creek. Iloilo City is not hemmed in by steep slopes – like Cebu and Baguio. However, the marshlands on which it sits, are flood prone, by natural design. Riverfront properties face the highest flood risk. Within Iloilo City alone, these properties stretch over 113 kilometers.

Located at the southeastern corner of Panay Island, with a 21-kilometer coastline facing the Guimaras Strait, much of Iloilo City's substrate is reclaimed land. It is recorded that much of this land conversion took place during a period of urbanization and industrialization in the late 19<sup>th</sup> Century.

An analysis of rainfall trends in Iloilo over the last twenty years indicates that there has been no significant change in mean rainfall. However, a closer look at the data reveals **high inter-annual variability** and **extreme weather events** at both ends of the wet/dry spectrum. The crash of the rice crop in 2010 was attributed to drought.

Iloilo City also sits within the typhoon belt. Typhoon Frank, the city's most recent extreme weather event, spawned widespread floods, described locally as "historical" in severity. Though not as frequent in this area as Luzon, storms such as this are likely to recur.

Iloilo City's coastline was originally fringed with extensive mangrove forests. These have long been replaced by fishponds, and are now mostly gone. In parallel to **intensified typhoon cyclones** and **extreme rainfall**, it is likely that Iloilo City's exposed coastline will have to deal with storm surge. Saltwater

intrusion and land subsidence, as a direct result of excessive groundwater extraction, has also been reported here.

Iloilo City has long been known as an educational hub, as well as a center of the seafood and shipping trades. Rising **sea surface temperatures**, as well as **ocean acidification**, will undoubtedly give rise to negative impacts on the city's wild-caught fisheries and brackish water aquaculture fishponds. **Sea level rise**, compounded by storms and floods, could lead to increased economic disruption or dislocation, and eventually marginalize the low lying and reclaimed areas of the city. This could affect shipping, as well.

### **Historical Indicators of Climate / Environmental Exposure**

Although **Precipitation** has remained statistically constant at a mean annual level of 2,106 mm, data from the last twenty years reveals high inter-annual variability.

The **Annual Mean Temperature** has decreased over 20 years, from 28.6C in 1990 to 26.8C in 2010.

**Typhoon Threat** remains. Over the last 20 years, more than 40 tropical depressions and storms crossed this area. This represents a significantly higher typhoon exposure than Cebu. In more than one instance, flooding has ensued within portions of the city.

## **SOCIO – ECONOMIC SENSITIVITY**

<b>Land Area</b>	<b>78.34 sq km</b>
<b>Barangays</b>	<b>180</b>
<b>2010 Population</b>	<b>425,516</b>
<b>2010 Pop Density</b>	<b>5,432 / sq km</b>

**Population** has increased from 309,505 in 1990 to 425,516 in 2010 – an increase of 116,011 inhabitants. Population density has increased from 3,800+ / sq km in 1990 to an estimated 5,432 / sq km in 2010. **Although Iloilo City comes a close second to Baguio, in terms of population density, its population growth rate ranks only number three, at 1.53% for the 20-year period.**

As a hub for **Education**, Iloilo City has delivered dramatic growth from 220 schools in 1990 to 790 schools in 2010.

**Infrastructure** has improved. Iloilo City is air linked by a new inland airport, in Santa Barbara. Over the last 20 years, the city nearly doubled its bridge network from 1,139 linear meters in 1990, to 2,132 linear meters in 2010. In contrast, the city's road network has not seen much expansion.

With the city's expansion and development, the number of **Motor Vehicles** here has increased as well, from 26,075 vehicles in 1990, to 61,337 motor

vehicles in 2010. With no apparent parallel expansion of the road network, vehicle density may emerge as a serious concern.

**Passenger Traffic** to and from Iloilo has grown. Although sea-borne passenger traffic continues its dominance over this sector with an annual volume hovering at a level of 2 Million+ passengers, air-borne passenger traffic has shown a dramatic increase over the last twenty years, from 414,936 passengers in 1990, to over 1.58 Million passengers in 2010 – a 281% increase.

**Cargo & Freight** in and out of Iloilo City paint a similar picture, although air cargo volumes have shown dramatic increases, shipping remains the dominant mode of transportation. In 1990, annual air cargo volumes at Iloilo City made up merely 1,969 metric tons. By 2010, annual air cargo volumes hit more than 11,820 metric tons – a 500% increase. In comparison, sea-based cargo made up 1.72 Million metric tons in 1990. Although 1995 delivered a dramatic increase in sea cargo, up to 3.487 Million metric tons, this record has dropped steadily over the last 15 years with total volume of sea cargo hitting 3.442 Million MT in 2000, and skidding down further to 2.51 Million MT in 2005 and 2.48 Million metric tons in 2010.

Efforts aimed at boosting **Tourism** have not done as well. From barely 357 tourist rooms in 1990, the city offered 1,133 tourist rooms in 2010. In spite of this, hotel occupancy rates remained relatively modest, from 40% in 1990 to 47% in 2010 – significantly lower than Cebu and Davao. In the three years following El Nino in 1997-98, occupancy dropped to an all time low of 27%. Iloilo has yet to bring in the droves of visitors. There is clearly further room for growth.

**Wild Caught Fisheries** emerged as another non-growth sector for Iloilo City, reporting a performance of 1,019 metric tons in 1990, to only 1,148 metric tons in 2010. This is probably a reflection of the overfished status of the Visayan Seas.

With increased urbanization and land conversion, the city's **Agriculture** output has crashed. From an annual palay production approximating 7,900 metric tons in 1990, output dropped to barely 1,385 metric tons in 2010. Although the 2010 figure was attributed to drought, the 20-year data shows a steady downtrend. Annual livestock production has also taken a downward turn, though less dramatic. From 10,400 metric tons in 1990, this figure has dropped to slightly less than 8,000 metric tons in 2010. These trends are not unusual. As cities expand, agriculture gives way to more profitable land uses.

In 2010, new and renewed businesses generated P22.382 Billion worth of fresh investment for Iloilo City. Financing, Insurance, Real Estate and Business Services made up 59% percent of this investments pie. Community, social and personal services came in a distant second, making up barely 19%. As in Baguio's case, this investment preference is probably a result of increased urbanization.

## ADAPTIVE CAPACITY

Local Governance Performance Monitoring System (LGPMS)  
A Self Evaluation by the City Government

Areas of Governance	Iloilo City		
	2009	2010	Difference
<b>Administrative Governance</b>			
Local Legislation	4.11	4.45	0.34
Development Planning	4.24	4.91	0.67
Revenue Generation	5.00	5.00	-
Resource Allocation and Utilization	4.83	4.50	(0.33)
Customer Service - Civil Applications	4.40	4.75	0.35
Human Resources Management and Development	5.00	5.00	-
<b>Economic Governance</b>			
Support to Agriculture	3.81	4.42	0.61
Support to Fishery Services	2.53	4.01	1.48
Entrepreneurship, Business and Industry Promotion	3.83	3.79	(0.04)
<b>Social Governance</b>			
Health Services	4.90	4.97	0.07
Support to Education Services	4.80	5.00	0.20
Support to Housing and Basic Facilities	3.00	5.00	2.00
Peace, Security and Disaster Risk Management	4.12	4.50	0.38
<b>Environmental Governance</b>			
Forest Ecosystem Management	N/R	N/R	N/R
Freshwater Ecosystems Management	N/R	N/R	N/R
Coastal and Marine Ecosystems Management	5.00	4.67	(0.33)
Urban Ecosystems Management	4.13	4.25	0.12
<b>Valuing Fundamentals of Governance</b>			
Participation	4.00	5.00	1.00
Transparency	5.00	5.00	-
Financial Accountability	5.00	4.80	(0.20)

A self-rating of 5.00 is a perfect score. The Iloilo City government gave itself “excellent” ratings in 6 out of 18 criteria that make up the LGPM score sheet, or an **average score of 4.67 for 2010**.

*It did not submit ratings for two items on the checklist: Forest Ecosystem Management & Freshwater Ecosystems Management.*

**Crime Solution Efficiency** in 2010 was reported at 8.61%. In 2010, a total of 5,774 index and non-index crimes were recorded in Iloilo City. In proportion to the city’s 2010 population, this translates to 1,357 crimes per 100,000 people. **Iloilo logged the highest number of index crimes per 100,000 people and the lowest CSE score.**

In Iloilo City, average annual **Family Incomes increased** from P112,954 in 1991 to P283,604 in 2000 - a 151% increase over a 10-year period. Over the same term, average annual family expenditures increased from P101,962 in 1990 to P266,877 in 2000. **Savings decreased** from 10% of annual family

income in 1991 to 6% in 2000. **No reliable data was available from 2001 to 2010.**

**Functional Literacy** remained relatively stagnant for Region 6, from 81.5% in 2003 to 81.7% in 2008.

**City Revenues** registered at P1.16 Billion in 2008, and after deducting Expenditures, ended the year with Reserves of P195.8 Million. Broken down, this translates to Reserves of P467 per capita. This represents a marked improvement from Reserves of P248 per capita in 2004.

In 2010, the 121 banking offices in Iloilo City reported **568,617** active accounts representing a deposit value of **P54.7 Billion** – an average deposit value of **P96,198**.

Iloilo Province, where Iloilo City is located, registered a **Human Development Index value of 0.664 in 2006**, an improvement from 0.622 in 2003. Of the four locations covered in this assessment, **Iloilo Province ranked #2 for this indicator.**

## LIST OF DEVELOPMENT DRIVERS

**Primary Driver EDUCATION**

**Secondary Driver POVERTY**

Additional Drivers CULTURAL/SOCIAL BEHAVIOR  
WATER & ENERGY  
INVESTMENTS  
ENVIRONMENTAL MANAGEMENT  
MANUFACTURING TECHNOLOGY  
GOVERNANCE  
ROADS & TRANSPORT  
IN-MIGRATION.

## SCENARIOS DEVELOPED

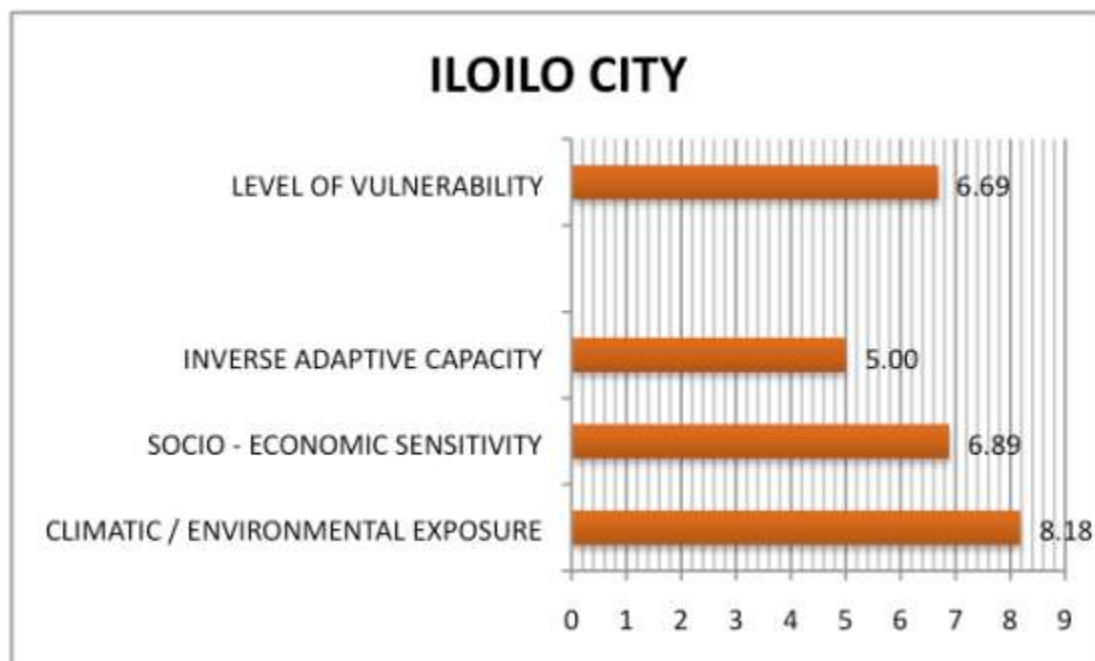
Best case: Peaceful, Orderly Society / High Quality Human Power

Mid case A: Peaceful, Orderly Society / Poor Quality Human Power

Mid case B: Breakdown of Society / High Quality Human Power

Worst case: Breakdown of Society / Poor Quality Human Power

## ASSESSMENT & INTEGRATION



Iloilo City has the second highest population density of the four cities in this study. Sitting on reclaimed marshland, it also remains highly flood-prone. In combination, these two factors constitute a serious risk. Next to Baguio, Iloilo City emerged as the second most vulnerable city in this study.

If this city is to achieve sustainability and maintain its competitiveness in a climate-defined future, it is clear that a sustained effort to better manage land use, infrastructure, land / sea access as well as flooding, is put in place through a mix of natural and engineered initiatives. With rice production moving out of the city, and the volume of wild caught fish remaining virtually stagnant over 20 years, it is apparent that Iloilo City is increasingly dependent on outside sources for its food supply. The four main areas of new investment, i.e., financing, insurance, real estate and business services, all seem to echo the indication that urbanization is the path that Iloilo has chosen to take. Maintaining good access via land, sea or air will, therefore, be critical.

The island of Panay has four commercial airports. Iloilo City continues to grow. It has the opportunity to ensure the city's economic connectivity and strengthen intra-island access by encouraging strategic investments designed to retrofit and upgrade its road network, shipping and fisheries-related facilities, to better manage the city's flood prone areas and minimize economic dislocation. This is an advantage that Iloilo should leverage.

As one of the smaller cities in our list of four, Iloilo City logged the lowest Functional Literacy scores. It also registered the highest index crime rate, as well as the lowest crime solution efficiency score. Furthermore, in contrast to all three other cities, Iloilo's Family Savings as a percentage of Revenue shrank over the last 20 years. It is no surprise, therefore, that the Iloilo stakeholders who participated in the scenario building exercises identified Education and Poverty as the two top development drivers likely to exert a strong influence on the city's future. It is worthwhile mentioning that Iloilo was the only city that chose Education, rather than Governance, as their top development driver.

Virtually all the scenarios generated in Iloilo indicate a desire for the city to adopt a clean, climate-appropriate and more equitable development path. In their opinion, this involves providing its populace with the knowledge, skills and support services needed to preserve Ilonggo identity and Iloilo heritage, while retaining its economic role in the Western Visayas. There seemed to be consensus that unless the city shifts to a development model founded on a clearer grasp of the future, the strengths it currently enjoys may diminish. These scenarios described the possible emergence of concerns related to health and life expectancy, labor, food security, literacy, potable water, energy, the cost of living and crime. These are the same concerns that emerge from unbridled urbanization.

In contrast to both Cebu and Davao, that both delivered impressive growth over 20 years, Iloilo City's volume of cargo tonnage shipped has shrunk. This may be a reflection of more fundamental changes that are taking place within the island of Panay, or within the city's economy itself. It is interesting to note that, although ship-borne passenger traffic has remained constant over 20 years, both air-borne passenger traffic as well as air cargo has grown dramatically. This is probably not due to tourism growth. Iloilo came in the lowest in terms of tourism arrivals, significantly lower than the other three cities. This is no surprise, seeing that it also has the least number of hotel rooms available.

The city has managed to keep population growth down at 1.53%, and the number of schools within the city, have risen from 220 to 790. These are bright spots. If Iloilo City has made the strategic decision to position itself, along with Baguio, Cebu and Davao, as an educational center, while avoiding the problems of congestion and population density, its challenge may, in fact, be re-invention.

**The scenarios built by Iloilo stakeholders emphasized the need to make the city more livable, better educated, better managed and more productive in a changing world. Pointing to a strong “cultural” element among city residents, there were participants who suggested that the challenges that face the people of Iloilo City actually go a lot deeper than merely improving governance or building “climate smart” infrastructure.**

**There is no doubt that well-managed drainage systems, as well as flood-free highways will remain key elements in the drive toward sustainable economic growth. For Iloilo City, however, the question is: will that be enough?**

## REFERENCES

### BAGUIO CITY

Variable	Source of Data
Total Annual Amount of Precipitation	PAGASA, 1990-2010
Annual Mean Temperature	PAGASA, 1990-2010
Total Annual Number of Typhoons	PAGASA, 1990-2011
Total Annual Population	Office of the City Planning and Development Coordinator, 1990-2010
Total Annual Population Density	Office of the City Planning and Development Coordinator, 1990-2011
Total Annual Number of Housing Units	National Statistics Office, 1990-2010
Total Annual Number of Enrolled Students	Office of the City Planning and Development Coordinator, 1990-2010
Total Annual Production Volume of Vegetables and Cut Flowers	Bureau of Agricultural Statistics, 1995-2010
Total Annual Production Volume of Livestock and Poultry	Bureau of Agricultural Statistics, 1995-2010
Total Annual Number of Tourist Traffic	Office of the City Planning and Development Coordinator, 1990-2010
Total Annual Number of Rooms	National Statistical Coordination Board, 1999-2008
Annual Mean Occupancy Rate	National Statistical Coordination Board, 1990-2010
Total Annual Value of Investments	City Treasury Office, 1990-2010
Local Governance Performance Monitoring System	Department of Interior and Local Government, 2009-2010
Total Annual Number of Employed	National Statistics Office, 1990-2010
Total Annual Number of Employed by Occupation Group	National Statistics Office, 1990-2010
Annual Mean Functional Literacy in CAR	National Statistics Office, 2003 & 2008
Annual Mean Value of Family Income	National Statistics Office, 1990-2010
Total Audited Annual City Income, Expenditure, and Savings per Capita	Commission on Audit, 2004-2008
Total Annual Number of Banking Offices, Number of Accounts and Deposits	Philippine Deposit Insurance Commission, 2009-2010
Annual Mean Human Development Index Value	Human Development Network, 2003-2006

### CEBU CITY

Variable	Source of Data
Total Annual Number of Typhoons	PAG-ASA, 1990-2009
Total Annual Number of Typhoons	PAG-ASA, 1990-2009
Total Annual Population	National Statistics Office, 1990-2010
Total Annual Population Density	National Statistics Office, 1990-2011
Total Annual Number of Business Establishments	Cebu City Management Information and Computer Services, 1995-2010
Total Annual Volume of Cargo Discharged and Unloaded at the Ports	Cebu Ports Authority, 1990-2010
Total Annual Value of Foreign Trade	National Statistics Office, 1990-2008
Total Annual Number of Hotel Rooms	Department of Tourism, 2005-2010
Total Annual Number of Tourist Arrivals	Department of Tourism, 2005-2010
Total Annual Hotel Occupancy Rate	Department of Tourism, 1990-2010
Local Governance Performance Monitoring System	Department of Interior and Local Government, 2009-2010
Total Annual City Revenue, Expenditure, Savings and Reserve per Capita	Commission on Audit, 2007-2008
Functional Literacy Rate of Population 10-64 Years Old, Region and Sex	National Statistics Office, 2003-2008

Total Annual Number of Banking Offices, Number of Accounts and Deposits Human Development Index	Philippine Deposit Insurance Commission, 2009-2010 Human Development Network, 2003-2006
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## DAVAO CITY

Variable	Source of Data
Average Annual Rainfall	PAG-ASA, 1990-2009
Average Annual Temperature	PAG-ASA, 1990-2010
Total Annual Population	National Statistics Office, 1990-2010
Annual Population Density	National Statistics Office, 1990-2010
Total Annual Number of Registered Motor Vehicles by Type	National Statistics Coordination Board (NSCB), 1990-2005
Total Annual Banana Production	Bureau of Agricultural Statistics, 1990-2010
Total Annual Production of Other Selected Fruit Crops	Bureau of Agricultural Statistics, 1990-2010
Total Annual Corn Production	Bureau of Agricultural Statistics, 1990- 2010
Total Annual Palay Production	Bureau of Agricultural Statistics, 1990- 2010
Total Annual Swine/Hog and Poultry Production	Bureau of Agricultural Statistics, 1995- 2010
Total Annual Value of Foreign Trade	National Statistics Coordination Board (NSCB), 1990-2010
Total Annual Volume of Cargo Discharged and Loaded at the Port	National Statistics Coordination Board (NSCB), 1995-2009
Total Annual Number of Embarking and Disembarking Sea-based Passengers	National Statistics Coordination Board (NSCB), 1995-2009
Total Annual Tourist Arrivals by Type	National Statistics Coordination Board (NSCB), 1995-2009
Total Annual Number of Business Establishments and Value of Investments	National Statistics Coordination Board (NSCB), 2006-2010
Total Annual Number of Elementary and Secondary Enrollees	National Statistics Coordination Board (NSCB), 1990-2010
Functional Literacy Rate of Population 10-64 Years Old	National Statistics Office, 2003-2008
Local Governance Performance Monitoring System	State of Local Governance Performance Report -Davao City, 2009 and 2010
Total Annual Number of Employed Persons and Employment Rate	National Statistics Coordination Board (NSCB), 1995-2009
Total Annual Family Income, Expenditure and Savings	National Statistics Coordination Board (NSCB), 1990-2006
Total Annual City Income, Expenditure and Reserve per Capita	Commission on Audit, 2003-2008
Total Annual Number of Banking Offices, Number of Accounts and Deposits	Philippine Deposit Insurance Commission, 2009-2010
Human Development Index	Human Development Network, 2003-2008

## ILOILO CITY

Variable	Source of Data
Total Annual Amount of Precipitation	PAGASA, 1990-2010
Annual Mean Temperature	PAGASA, 1990-2010
Total Annual Number of Tropical Cyclones	PAGASA, 1990-2010
Total Annual Population	National Statistics Office, 1990-2010
Annual Population Density	National Statistics Office, 1990-2010
Total Annual Length of Bridges	City Planning and Development Office, 2010
Total Annual Number of Registered Motor Vehicles	City Planning and Development Office, 2010
Total Annual Number of Passenger Traffic by Type	City Planning and Development Office, 2010
Total Annual Amount of Cargo by Type	City Planning and Development Office, 2010
Total Annual Number of Rooms	Department of Tourism, 1990-2010
Annual Mean Occupancy Rate	Department of Tourism, 1990-2010
Total Annual Number of Wild Caught Fisheries	Bureau of Agricultural Statistics, 2010
Total Annual Production Volume of Palay	Bureau of Agricultural Statistics, 2010
Total Annual Production Volume of Livestock and Poultry	Bureau of Agricultural Statistics, 2010
Local Governance Performance Monitoring System	Department of Interior and Local Government, 2009-2010
Annual Mean Value of Family Income	City Planning and Development Office, 2010
Annual Mean Functional Literacy in Western Visayas	National Statistics Office, 2003 & 2008
Total Audited Annual City Income, Expenditure, and Savings per Capita	Commission on Audit, 2004-2008
Total Annual Number of Banking Offices, Number of Accounts, and Deposits	Philippine Deposit Insurance Commission, 2009-2010
Human Development Index	Human Development Network, 2003-2008

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### Annex 1. BAGUIO CITY

Vector	Variable
1. Climate/Environmental Exposure	<ol style="list-style-type: none"> <li>1. Precipitation</li> <li>2. Temperature</li> <li>3. Typhoon Threat</li> <li>4. Flooding</li> </ol>
2. Socio-Economic Sensitivity	<ol style="list-style-type: none"> <li>1. Population</li> <li>2. Housing Units</li> <li>3. Educational Enrollment</li> <li>4. Vegetable and Cut Flower Production</li> <li>5. Livestock and Poultry Production</li> <li>6. Tourist Traffic</li> <li>7. New Business</li> <li>8. Water Supply</li> </ol>
3. Adaptive Capacity	<ol style="list-style-type: none"> <li>1. Local Governance Performance Monitoring System</li> <li>2. Crime Solution Efficiency</li> <li>3. Work Force</li> <li>4. Functional Literacy</li> <li>5. Family Income</li> <li>6. City Revenue</li> <li>7. Banking</li> <li>8. Human Development Index</li> </ol>

### Annex 2. CEBU CITY

Vector	Variable
1. Climate/Environmental Exposure	<ol style="list-style-type: none"> <li>1. Precipitation</li> <li>2. Landslides</li> <li>3. Typhoon Threat</li> <li>4. Flooding</li> </ol>
2. Socio-Economic Sensitivity	<ol style="list-style-type: none"> <li>1. Population</li> <li>2. Population Density</li> <li>4. Business Establishments</li> <li>5. Shipping</li> <li>6. Foreign Trade</li> <li>7. Number of Hotel Rooms</li> <li>8. Tourist Arrivals</li> <li>9. Hotel Occupancy Rates</li> <li>10. Land Classification and Protected Areas</li> </ol>
3. Adaptive Capacity	<ol style="list-style-type: none"> <li>1. Local Governance Performance Monitoring System (LGPMMS)</li> <li>2. Crime Solution Efficiency</li> <li>3. City Revenues</li> <li>4. Functional Literacy</li> <li>5. Banking</li> <li>6. Human Development Index</li> </ol>

### Annex 3. DAVAO CITY

Vector	Variable
1. Climate/Environmental Exposure	<ol style="list-style-type: none"> <li>1. Precipitation</li> <li>2. Temperature</li> <li>3. Typhoon Threat</li> <li>4. Flooding</li> </ol>
2. Socio-Economic Sensitivity	<ol style="list-style-type: none"> <li>1. Population</li> <li>2. Population Density</li> <li>3. Motor Vehicles</li> <li>4. Banana Production</li> <li>5. Other Fruit Crops Production</li> <li>6. Corn Production</li> <li>7. Palay Production</li> <li>8. Poultry and Swine Production</li> <li>9. Foreign Trade</li> <li>10. Shipping</li> <li>11. Sea-based Passengers</li> <li>12. Tourist Arrival</li> <li>13. Tourist Receipts</li> <li>13. Business Establishments</li> <li>14. Enrollment</li> </ol>
3. Adaptive Capacity	<ol style="list-style-type: none"> <li>1. Local Governance Performance Monitoring Systems (LGPMS)</li> <li>2. Crime Solution Efficiency</li> <li>3. Labor Pool</li> <li>4. Functional Literacy</li> <li>5. Family Income / Savings</li> <li>6. City Revenues</li> <li>7. Banking</li> <li>8. Human Development Index</li> </ol>

### Annex 4. ILOILO CITY

Vector	Variable
1. Climate/Environmental Exposure	<ol style="list-style-type: none"> <li>1. Precipitation</li> <li>2. Temperature</li> <li>3. Typhoon Threat</li> </ol>
2. Socio-Economic Sensitivity	<ol style="list-style-type: none"> <li>1. Population</li> <li>2. Infrastructure</li> <li>3. Motor Vehicles</li> <li>4. Passenger Traffic</li> <li>5. Cargo</li> <li>6. Tourism</li> <li>7. Wild Caught Fisheries</li> <li>8. Agriculture</li> <li>9. Investment</li> </ol>
3. Adaptive Capacity	<ol style="list-style-type: none"> <li>1. Local Governance Performance Monitoring System</li> <li>2. Crime Solution Efficiency</li> <li>3. Functional Literacy</li> <li>4. Family Income</li> <li>5. City Revenue</li> <li>6. Deposit Value</li> <li>7. Human Development Index</li> </ol>



## Annex 1. Baguio City

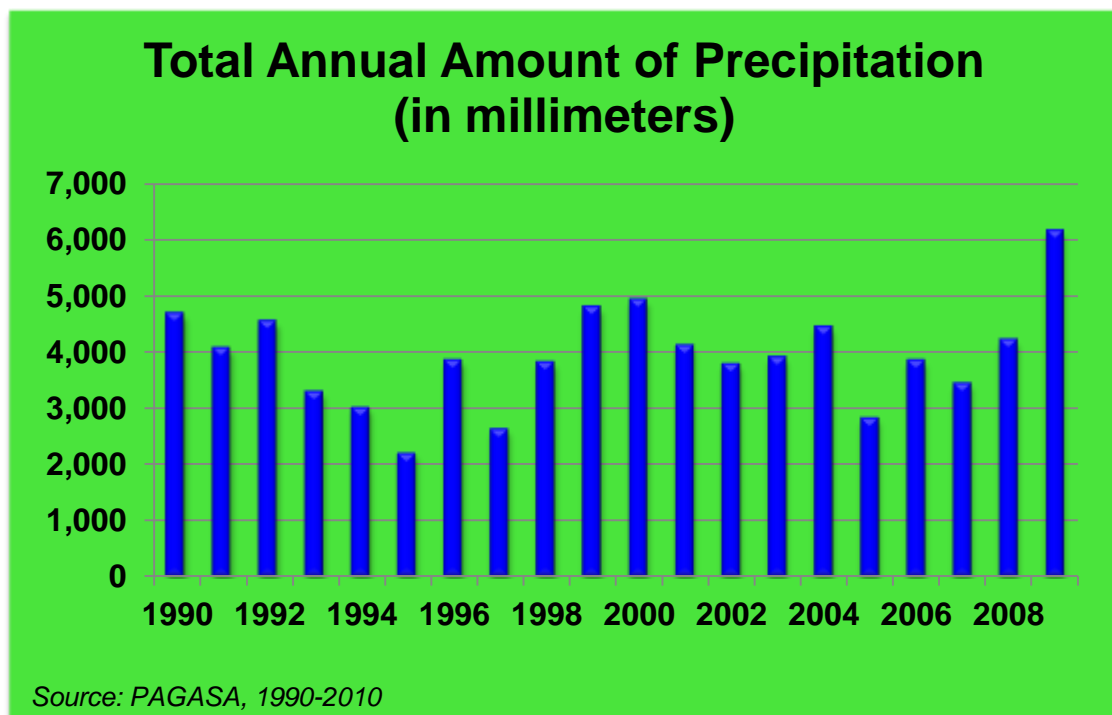


Figure 1. Total Annual Amount of Precipitation (in millimeters) in Baguio City

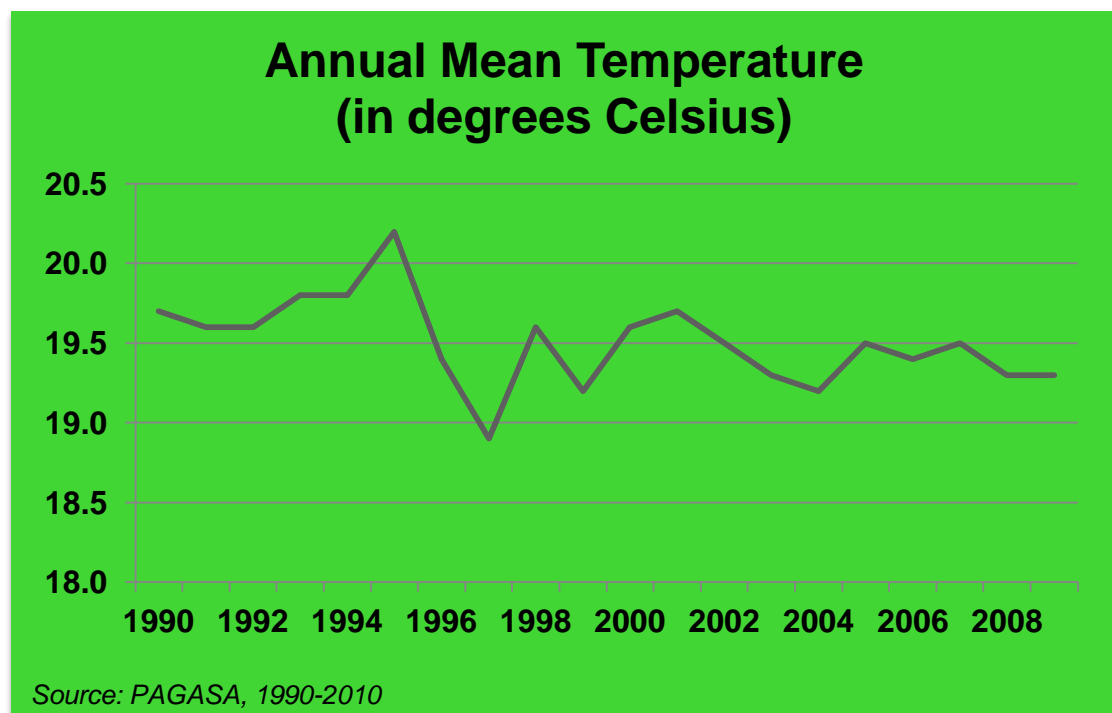


Figure 2. Annual Mean Temperature (in degrees Celsius) in Baguio City

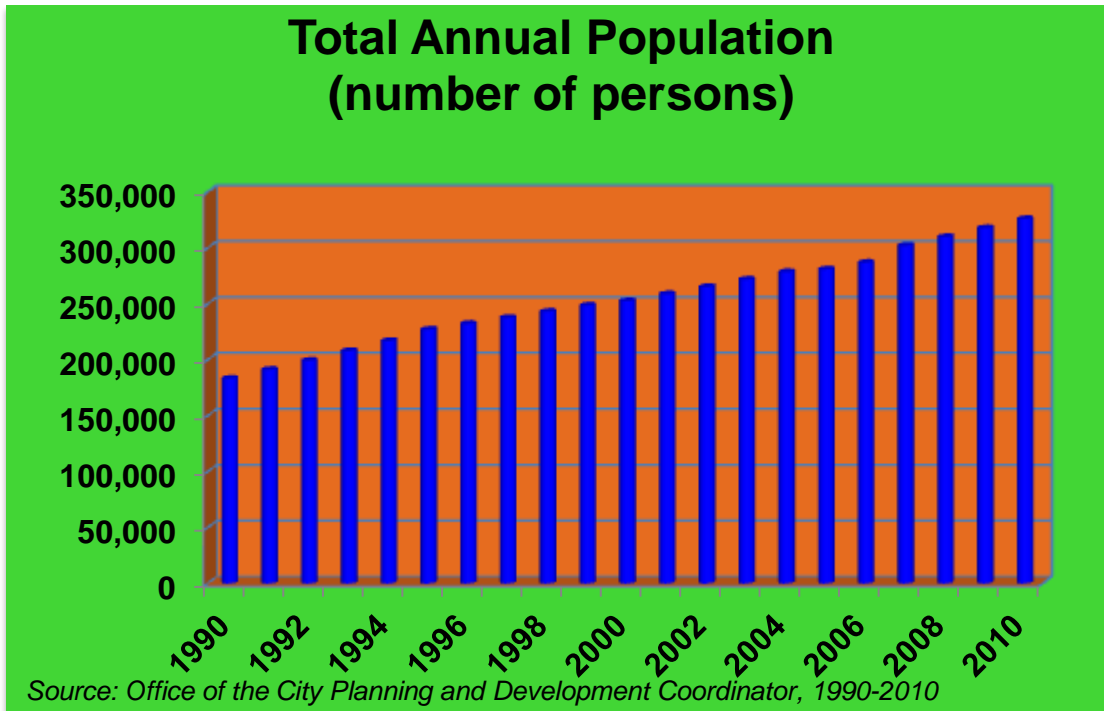


Figure 3. Total Annual Population (number of persons) in Baguio City

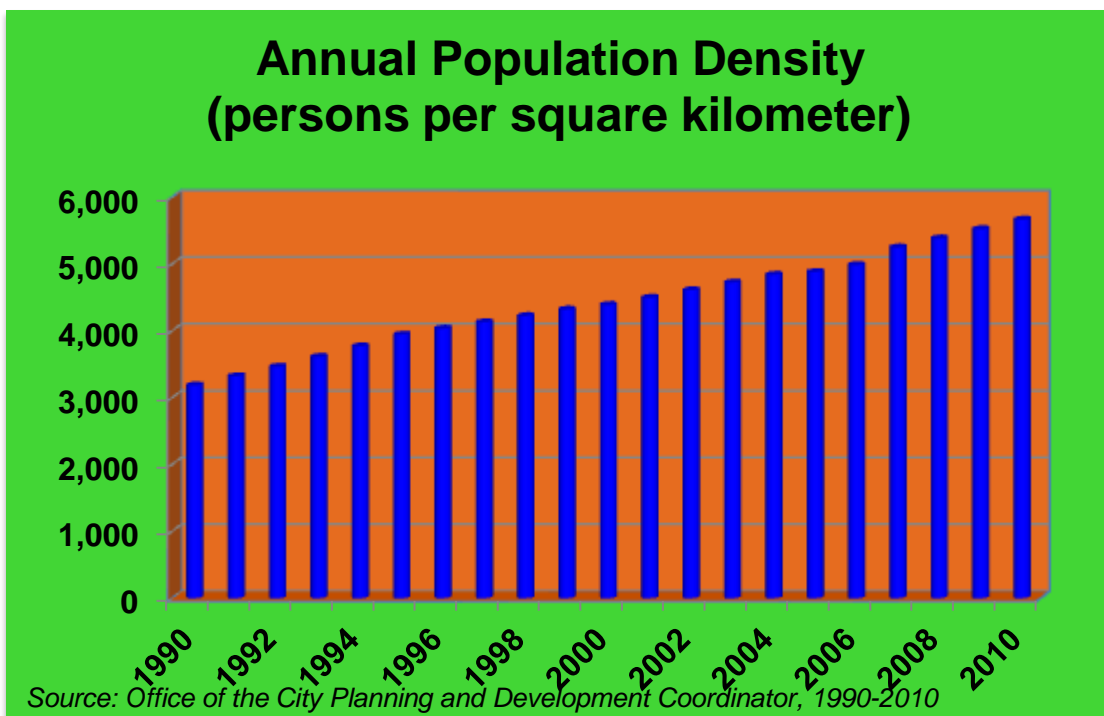


Figure 4. Annual Population Density (persons per square kilometer) in Baguio City

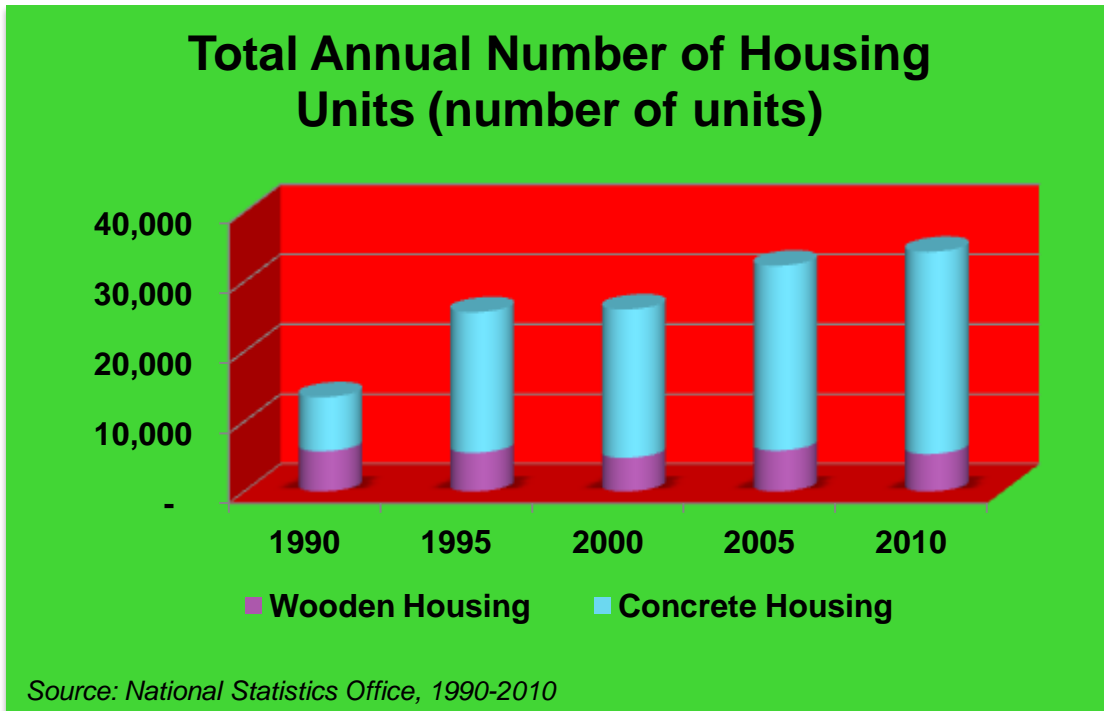


Figure 5. Total Annual Number of Housing Units (number of units) in Baguio City

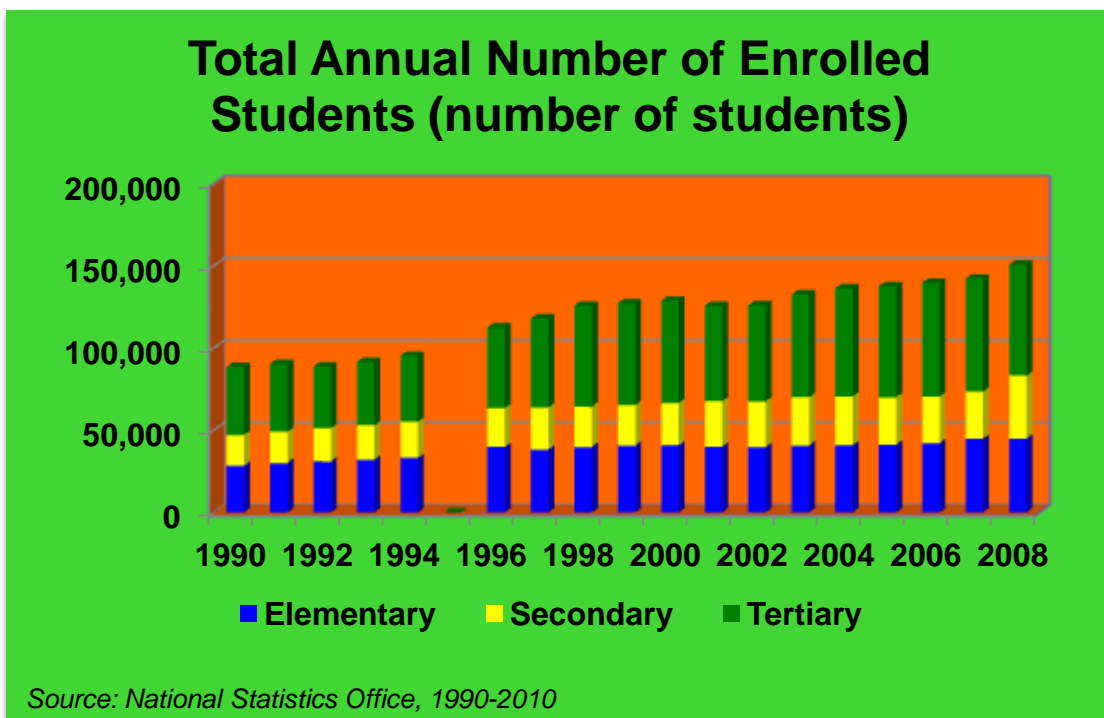


Figure 6. Total Annual Number of Enrolled Students (number of students) in Baguio City

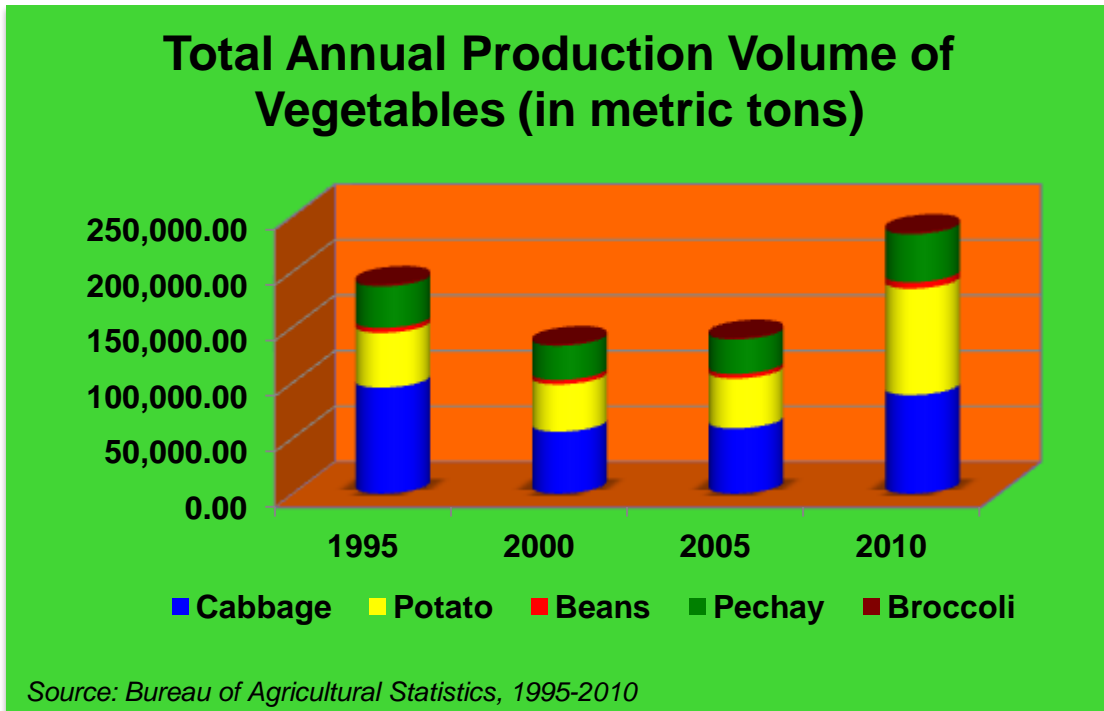


Figure 7. Total Annual Production Volume of Vegetables (in metric tons) in Baguio City

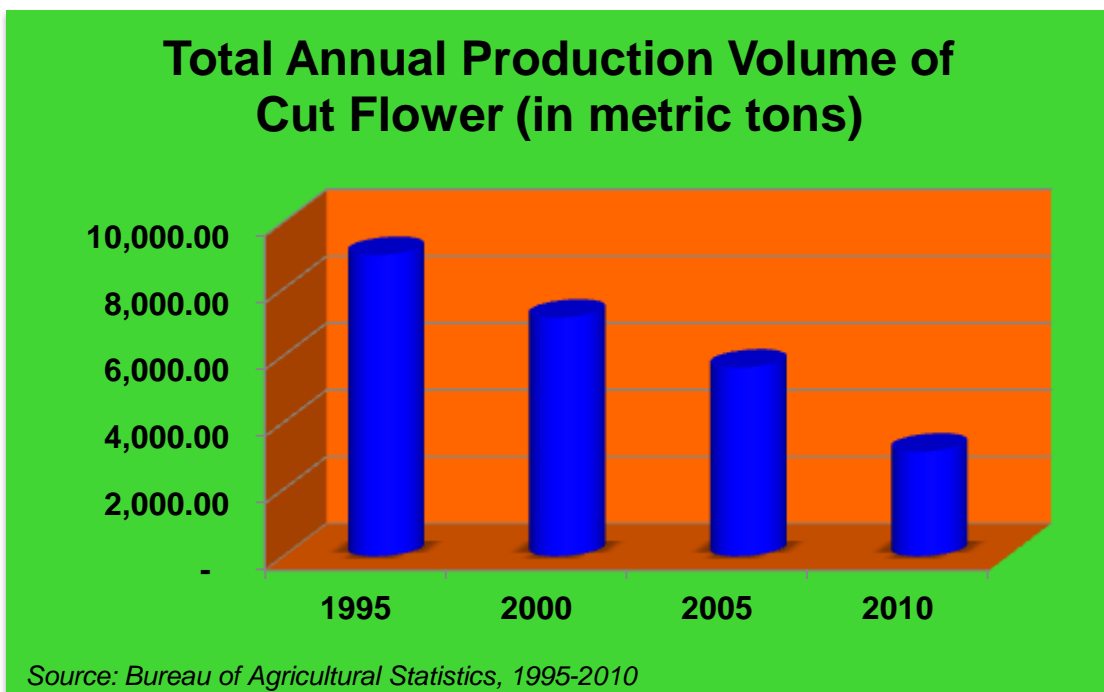


Figure 8. Total Annual Production Volume of Cut Flower (in metric tons) in Baguio City

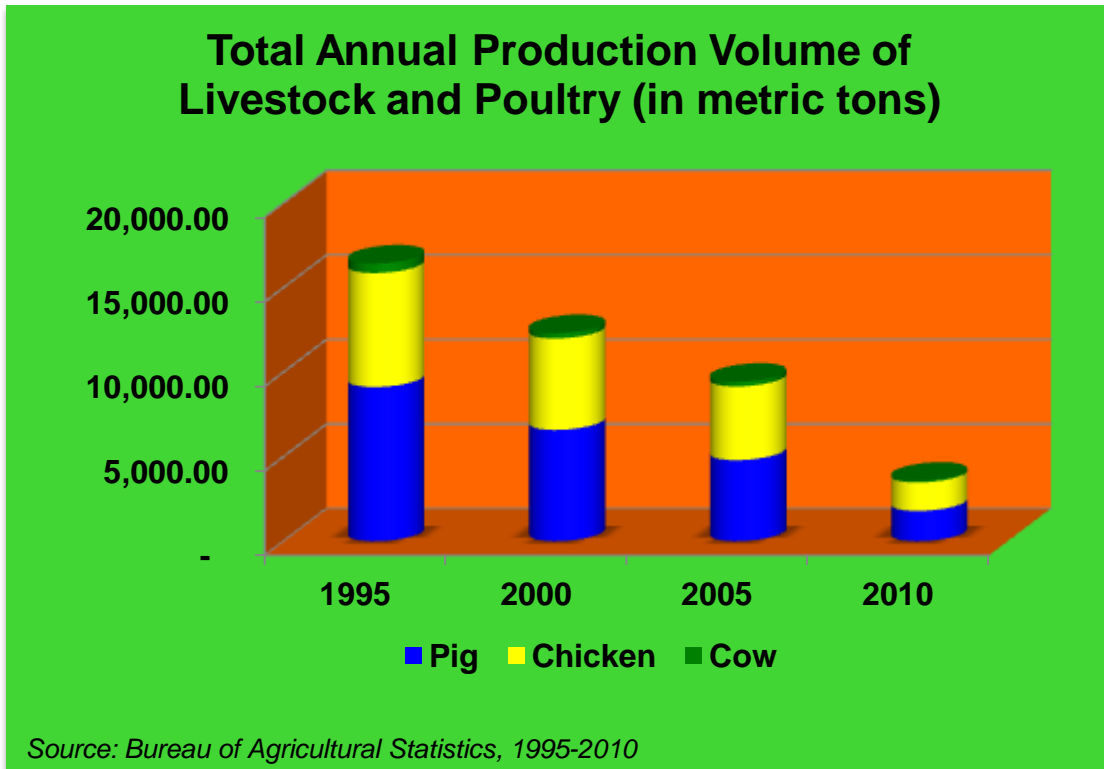


Figure 9. Total Annual Production Volume of Livestock and Poultry (in metric tons) in Baguio City



Figure 10. Total Annual Number of Tourist Traffic (number of tourists) in Baguio City

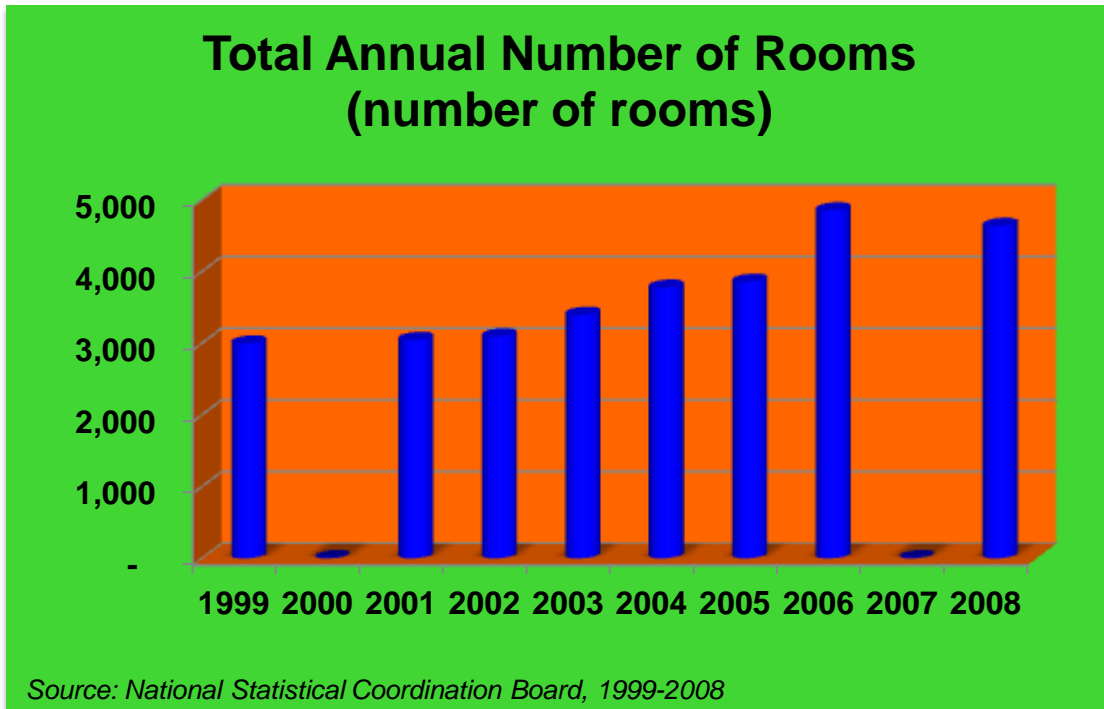


Figure 11. Total Annual Number of Rooms (number of rooms) in Baguio City

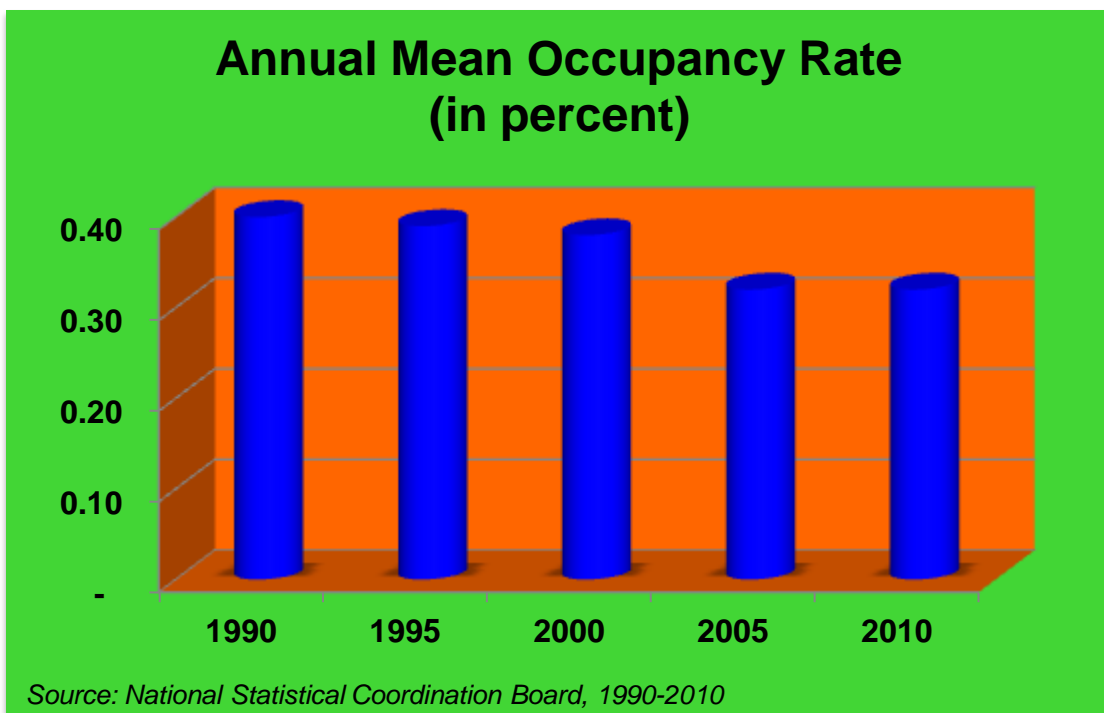


Figure 12. Annual Mean Occupancy Rate (in percent) in Baguio City

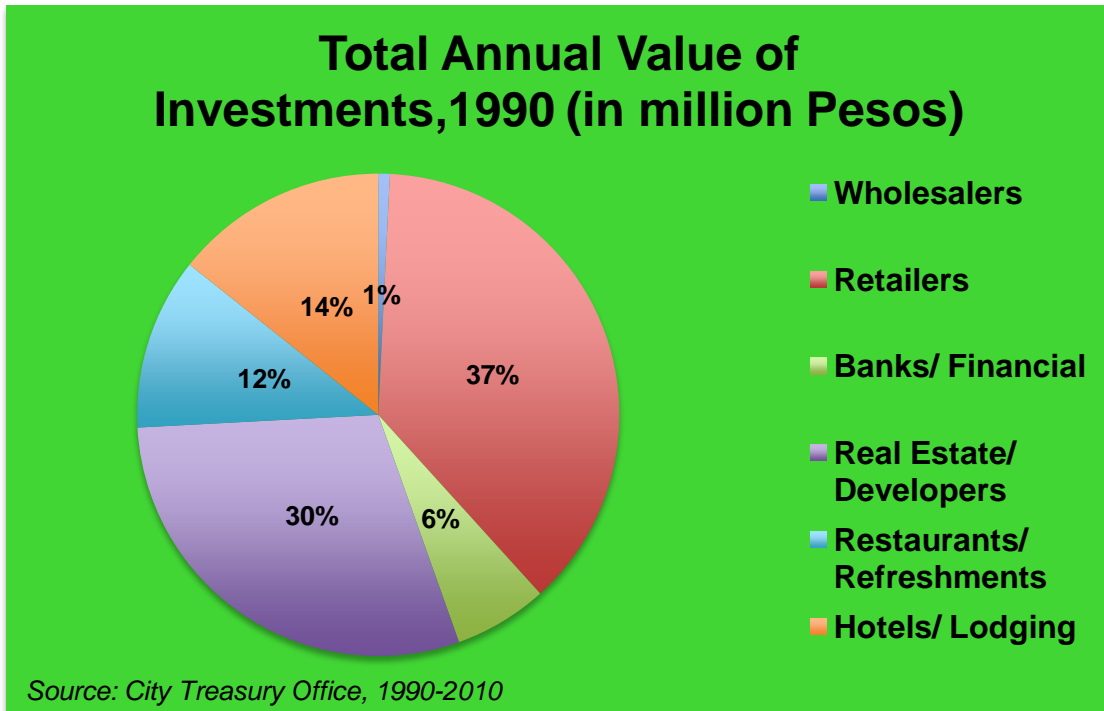


Figure 13. Total Annual Value of Investments, 1990 (in million Pesos) in Baguio City

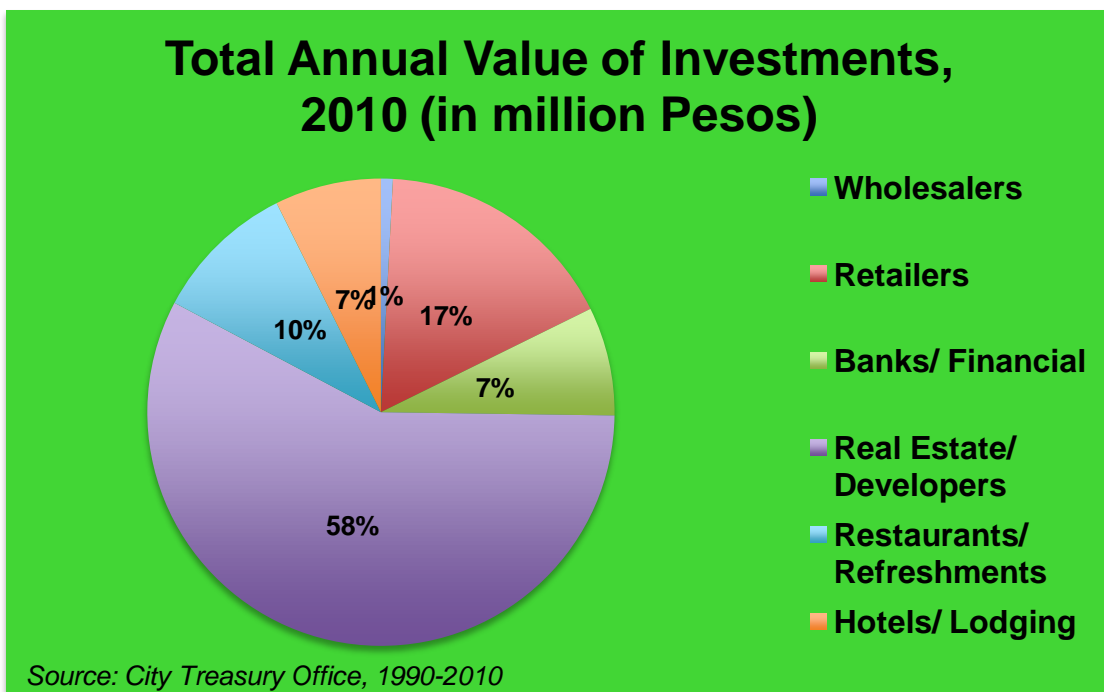


Figure 14. Total Annual Value of Investments, 2010 (in million Pesos) in Baguio City

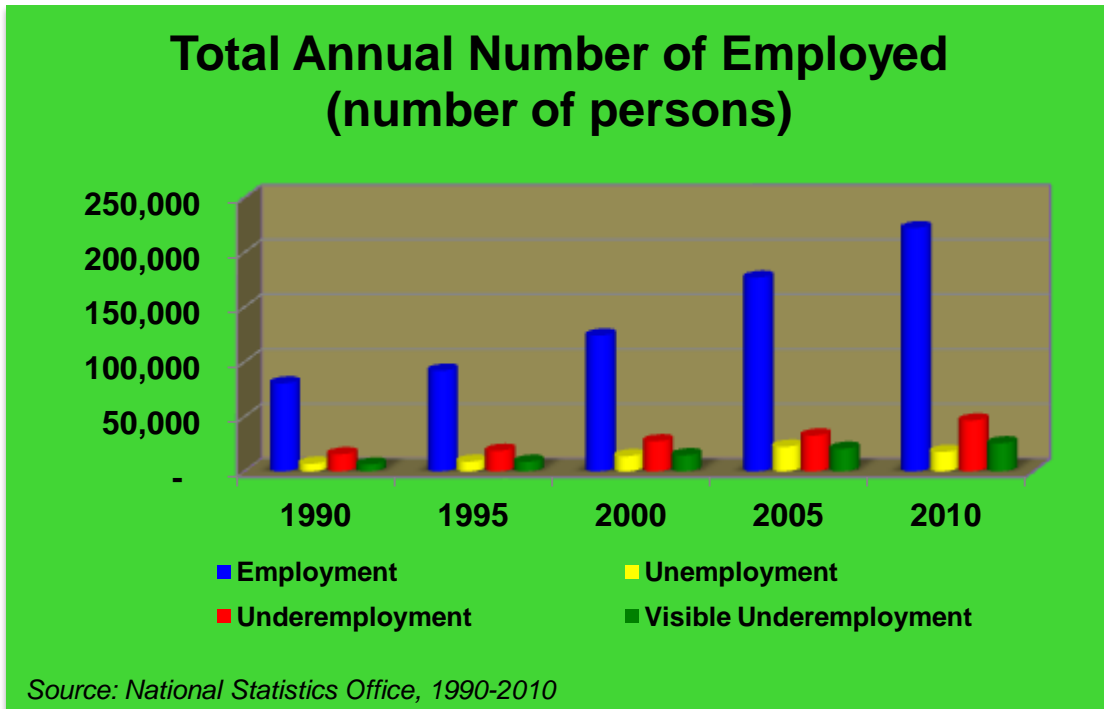


Figure 15. Total Annual Number of Employed (number of persons) in Baguio City



Figure 16. Total Annual Number of Employed by Occupation Group (number of persons) in Baguio City

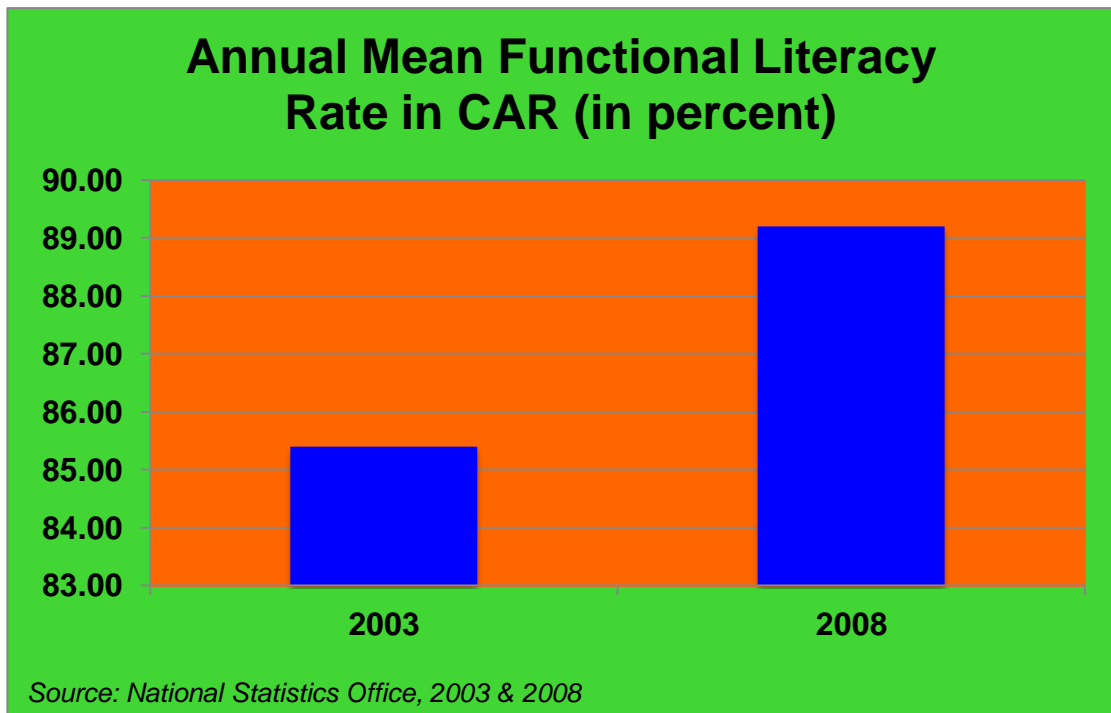


Figure 17. Annual Mean Functional Literacy Rate in CAR (in percent)

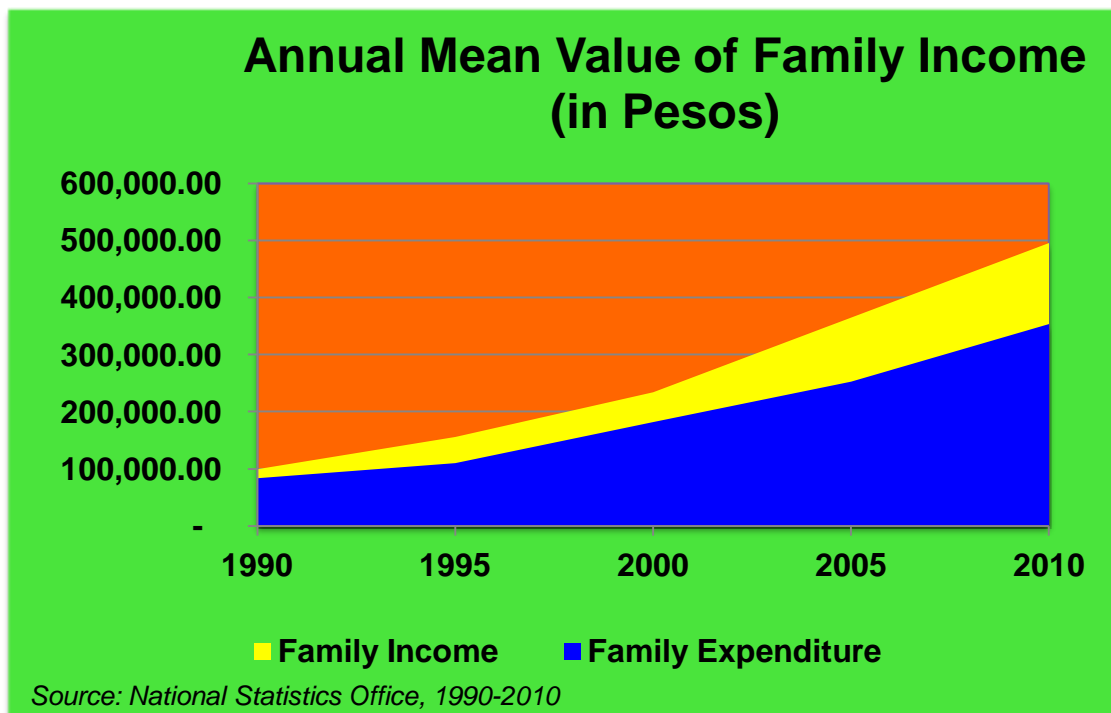


Figure 18. Annual Mean Value of Family Income (in Pesos) in Baguio City

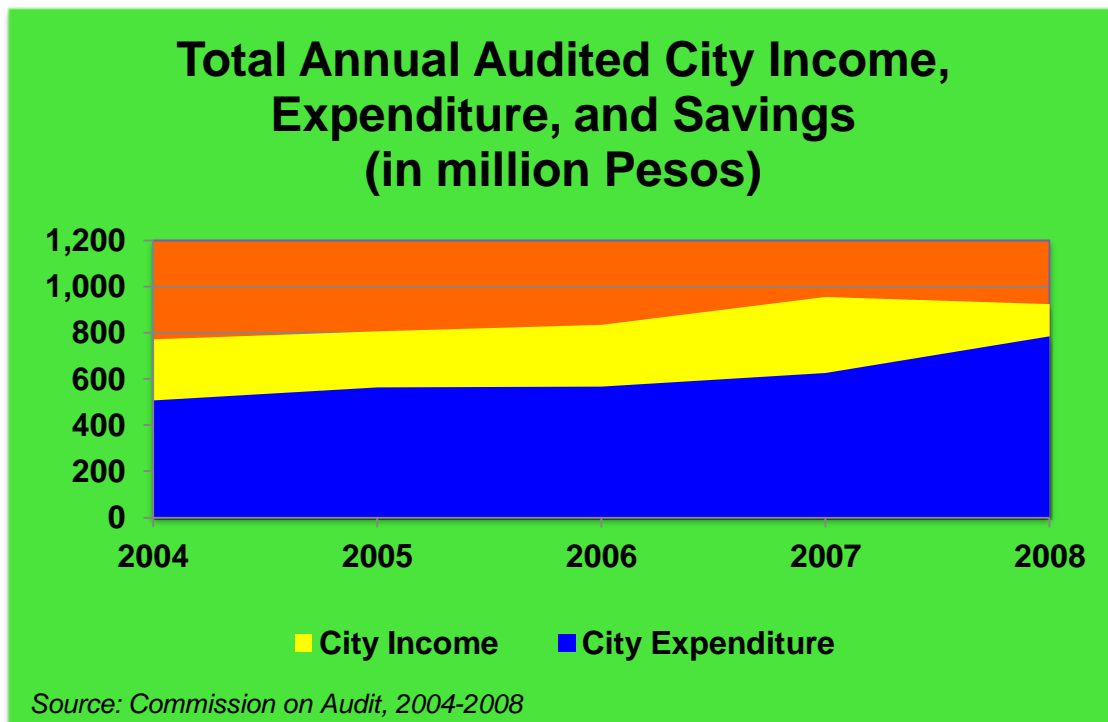


Figure 19. Total Annual Audited City Income, Expenditure, and Savings (in million Pesos) in Baguio City

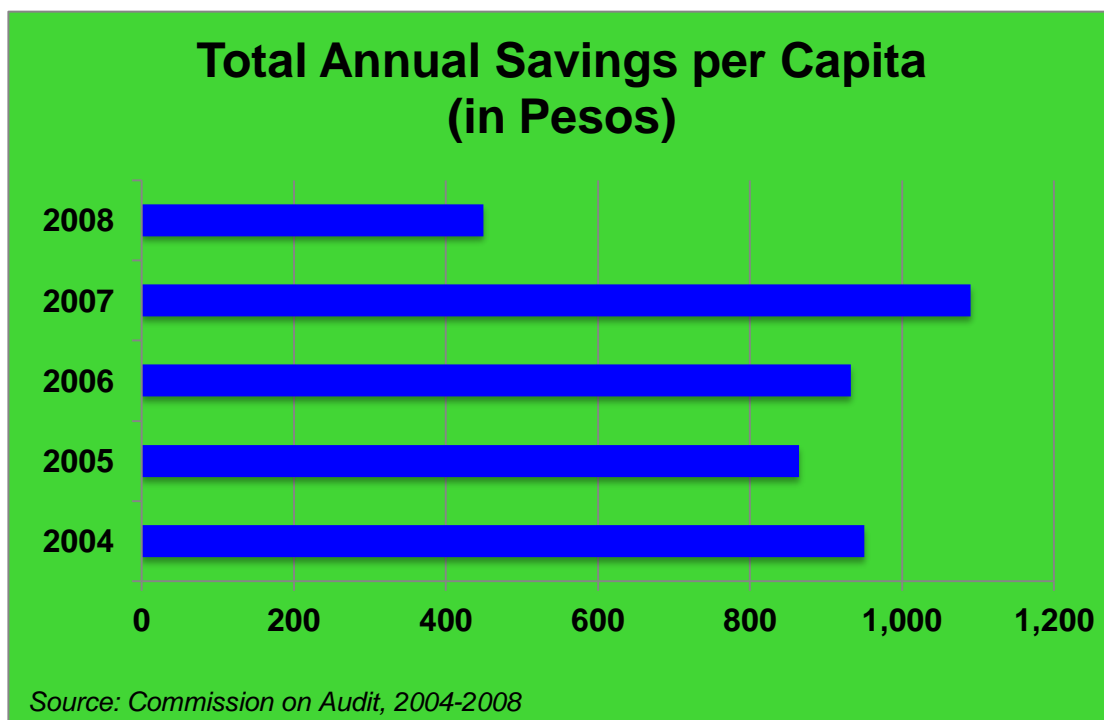


Figure 20. Total Annual Savings per Capita (in Pesos) in Baguio City

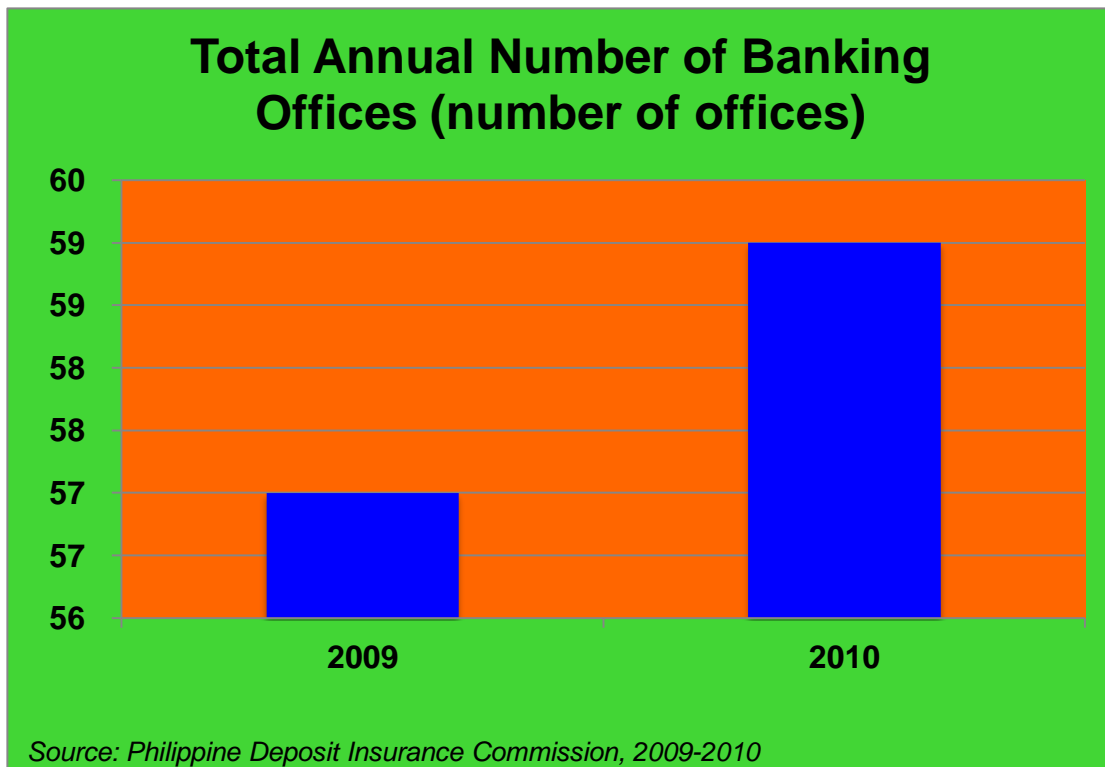


Figure 21. Total Annual Number of Banking Offices (number of offices) in Baguio City

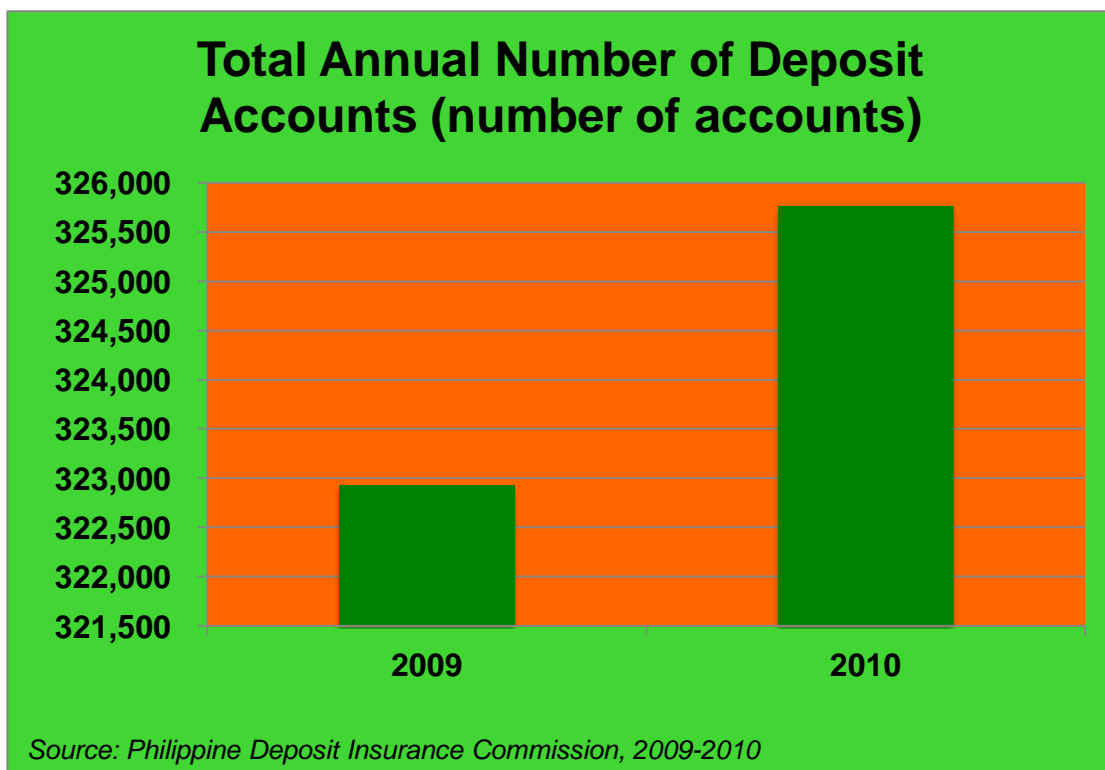


Figure 22. Total Annual Number of Deposit Accounts (number of accounts) in Baguio City

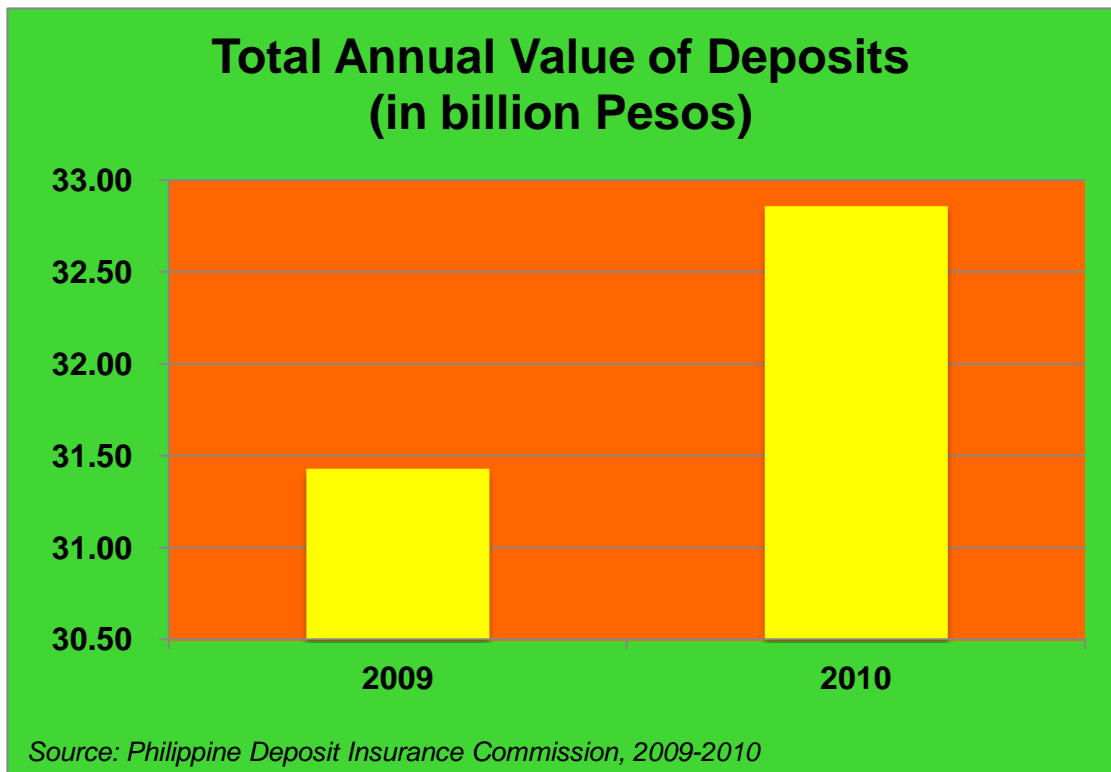


Figure 23. Total Annual Value of Deposits (in billion Pesos) in Baguio City

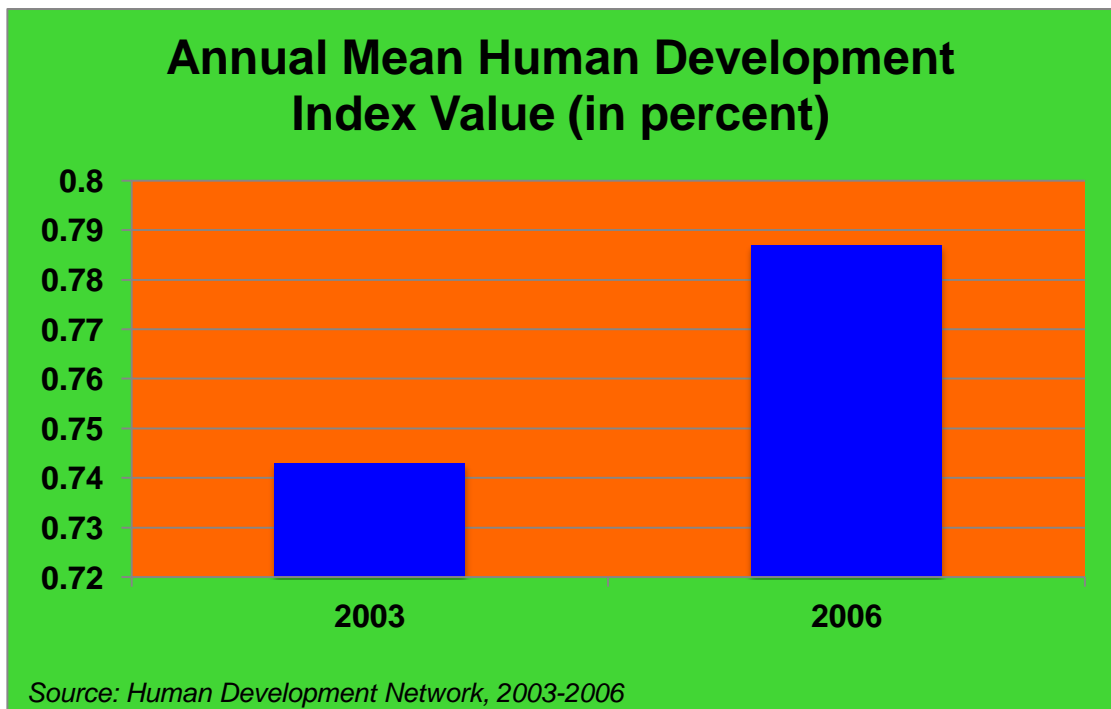


Figure 24. Annual Mean Human Development Index Value (in percent) in Baguio City

## Annex 2. Cebu City

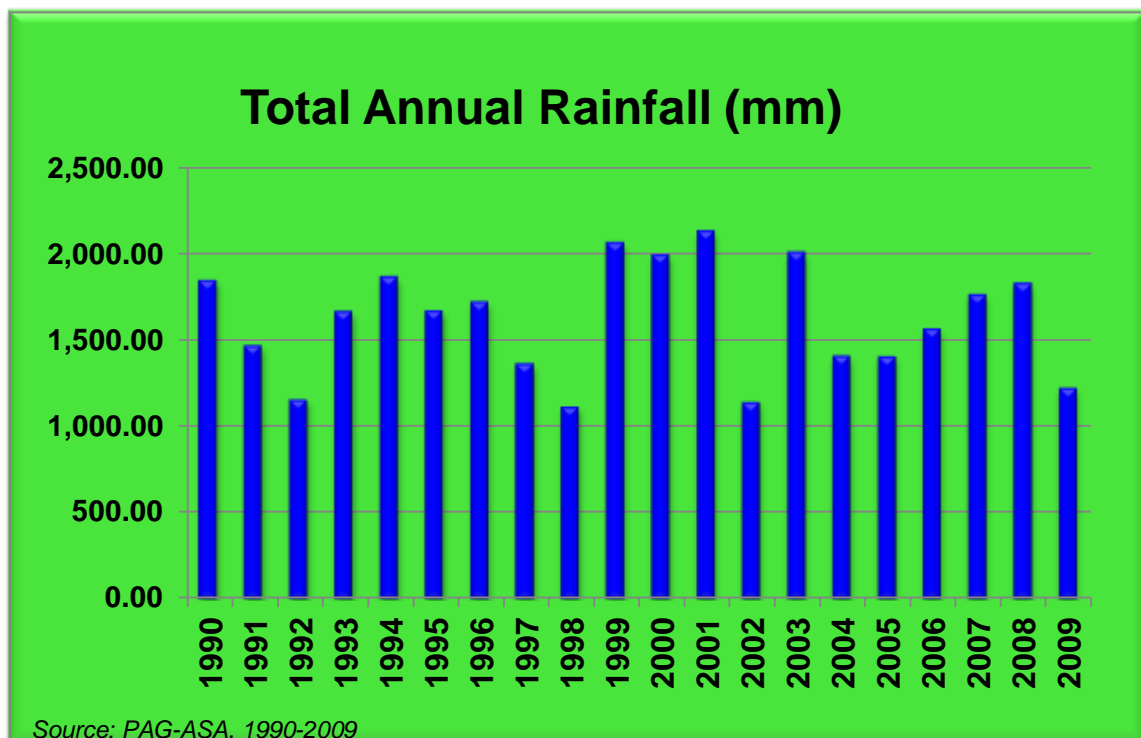


Figure 1. Total Annual Rainfall (mm) in Cebu City

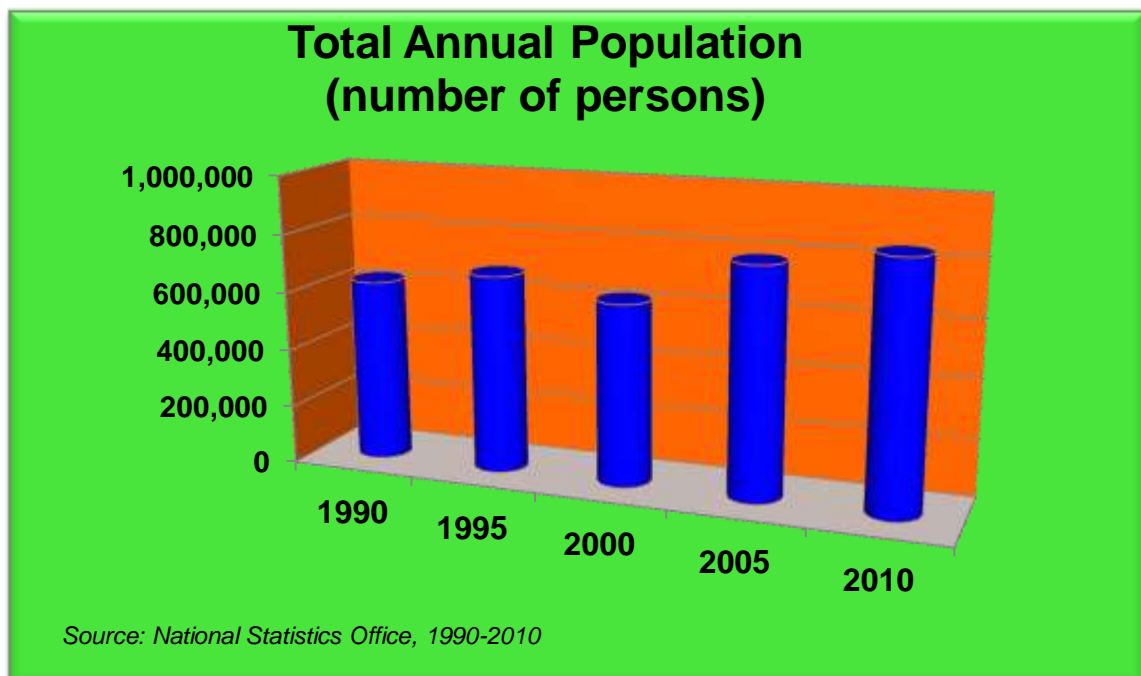


Figure 2. Total Annual Population (number of persons) in Cebu City

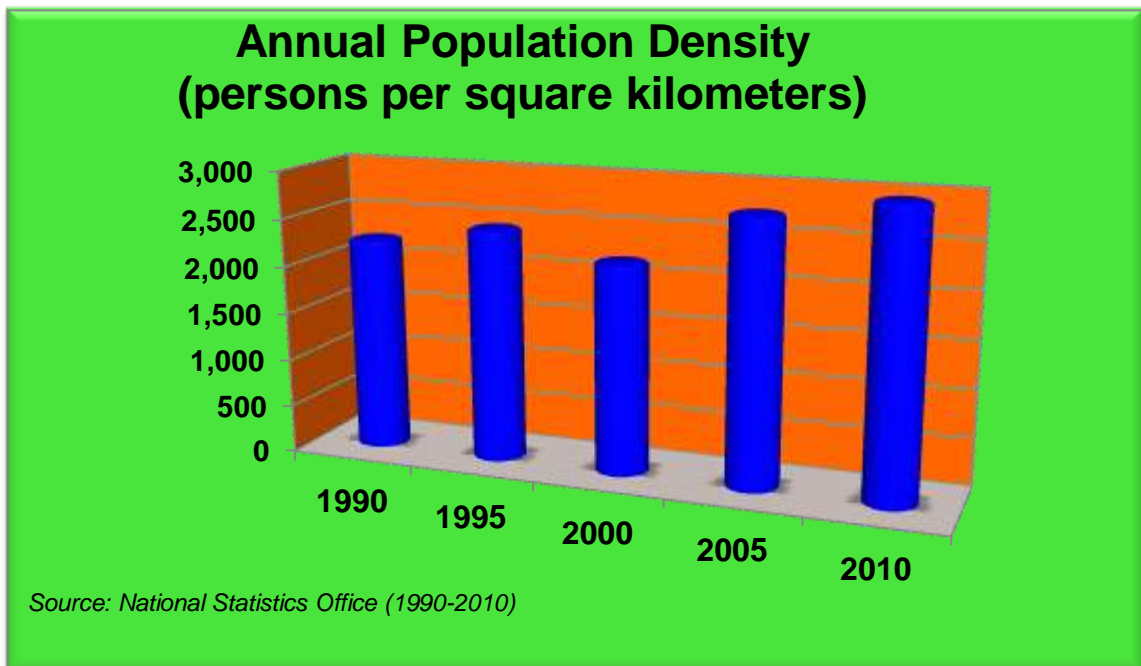


Figure 3. Total Annual Population Density (persons/sq km) in Cebu City

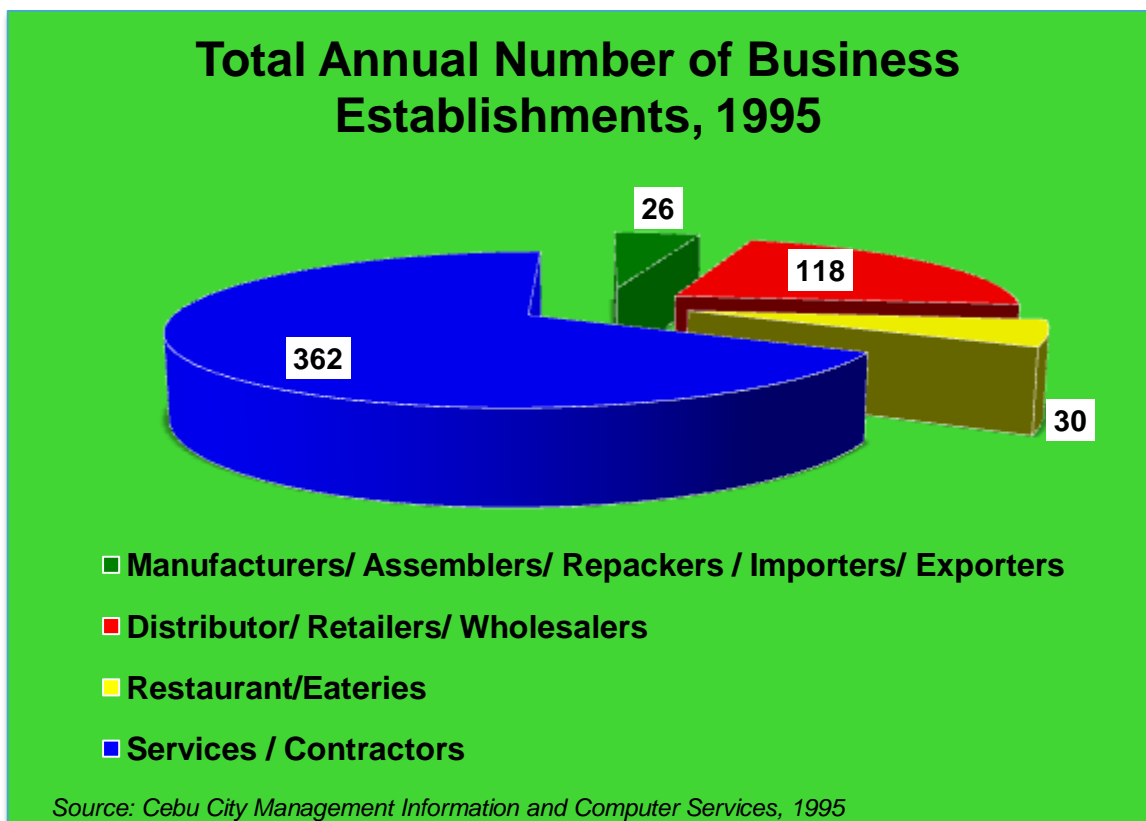
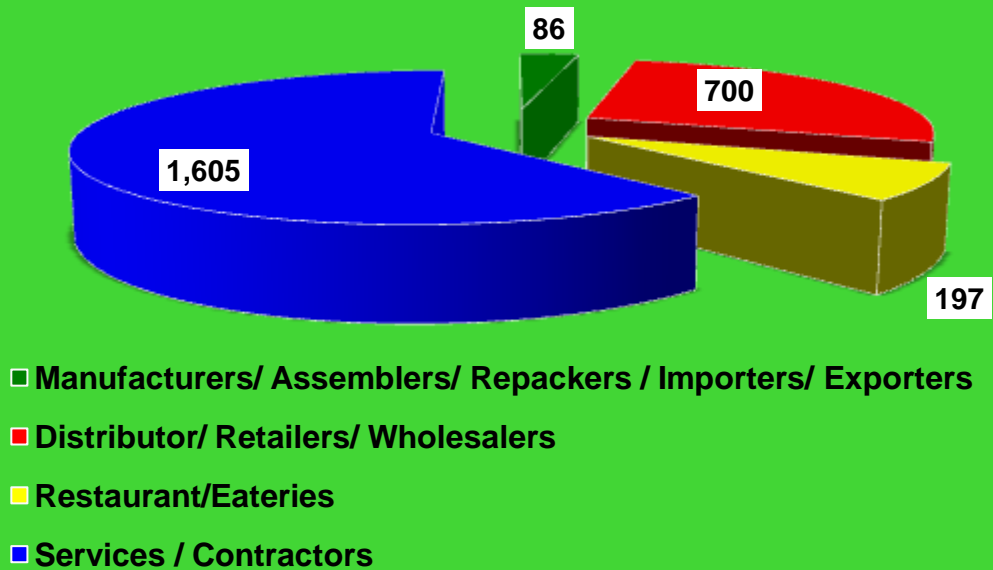


Figure 4. Total Annual Number of Establishments, 1995 in Cebu City

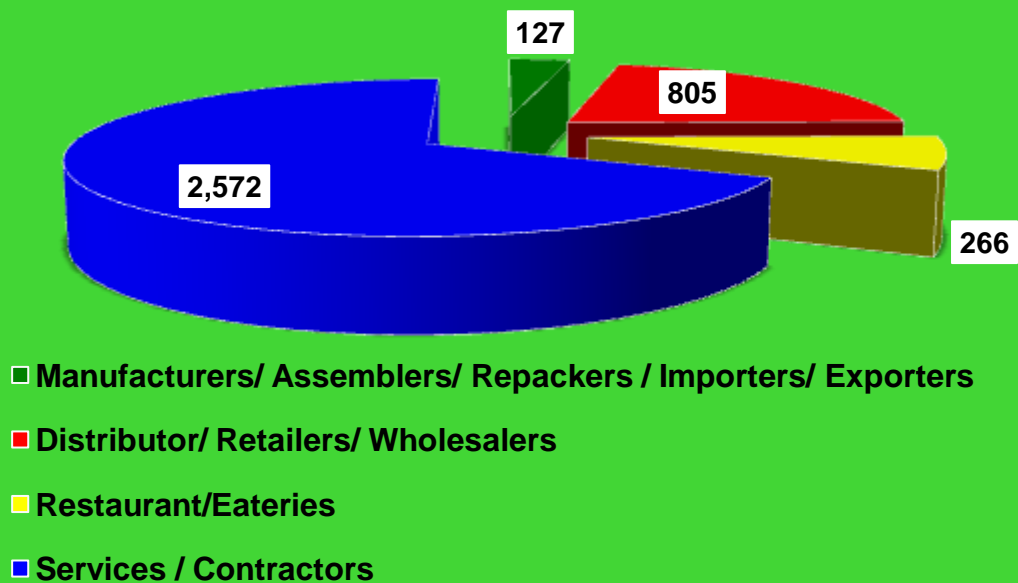
## Total Annual Number of Business Establishments, 2000



Source: Cebu City Management Information and Computer Services, 2000

Figure 5. Total Annual Number of Establishments, 2000 in Cebu City

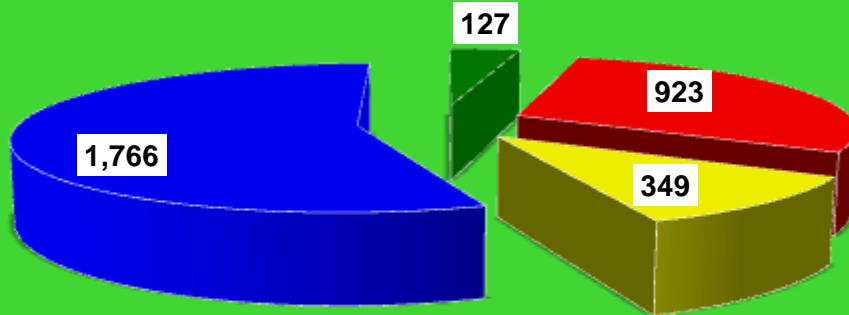
## Total Annual Number of Business Establishments, 2005



Source: Cebu City Management Information and Computer Services, 2005

Figure 6. Total Annual Number of Establishments, 2005 in Cebu City

## Total Annual Number of Business Establishments, 2010

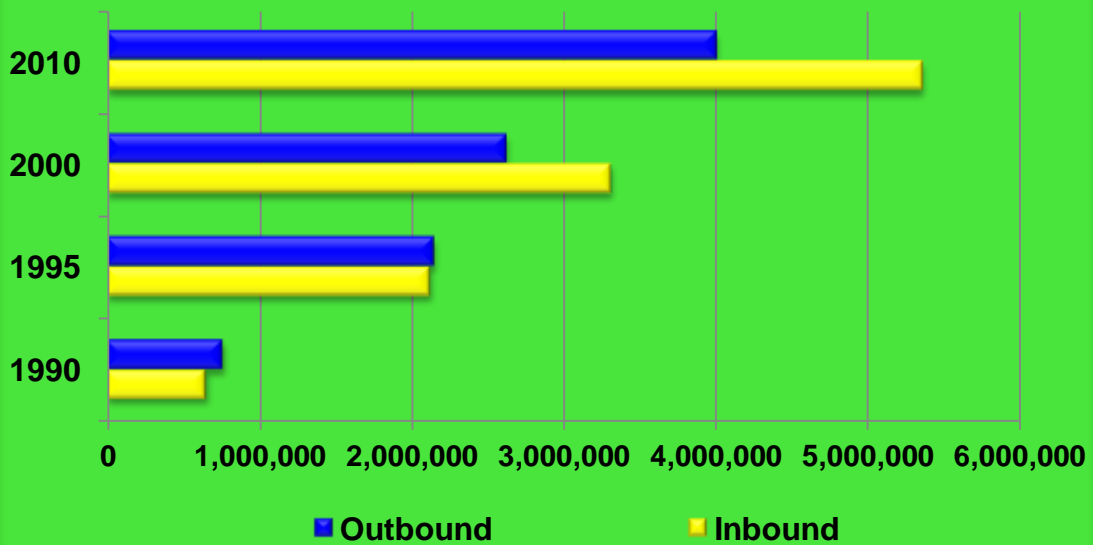


- Manufacturers/ Assemblers/ Repackers / Importers/ Exporters
- Distributor/ Retailers/ Wholesalers
- Restaurant/Eateries
- Services / Contractors

Source: Cebu City Management Information and Computer Services, 2010

Figure 7. Total Annual Number of Establishments, 2010 in Cebu City

## Total Annual Domestic Cargo Discharged and Loaded at the Ports (metric tons)



Source: Cebu Ports Authority, 1990-2010

Figure 8. Total Annual Volume of Foreign Cargo Discharged and Loaded at the Ports (metric tons) in Cebu City

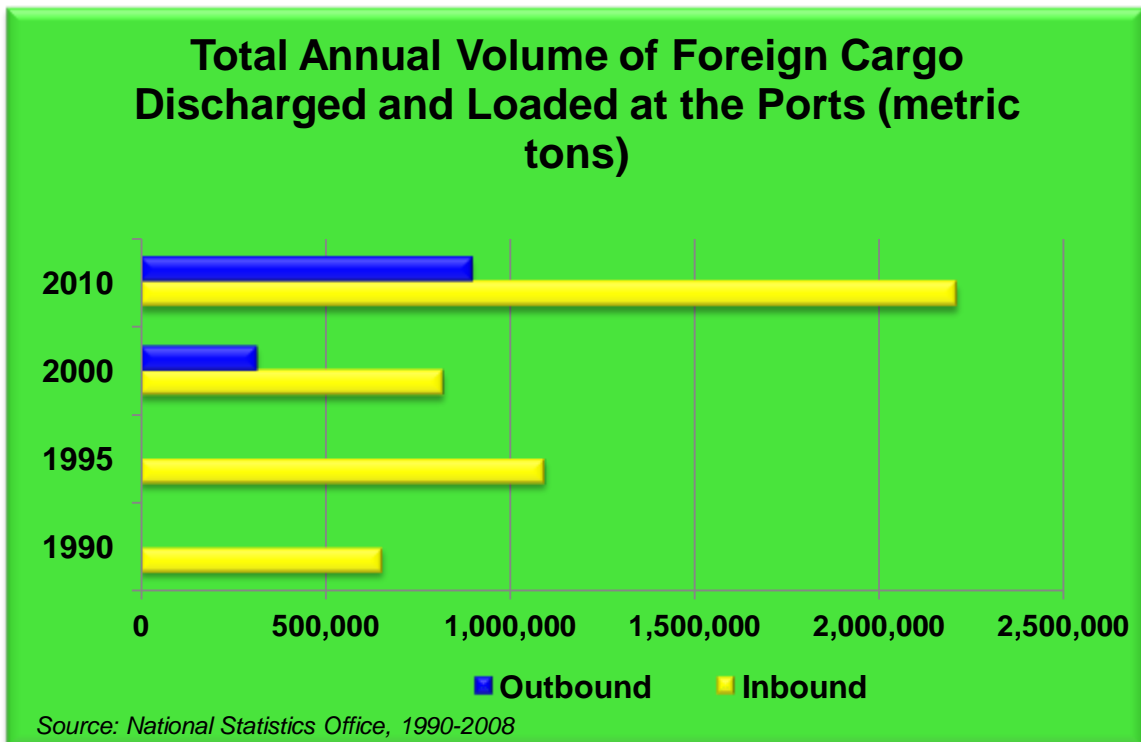


Figure 9. Total Annual Volume of Foreign Cargo Discharged and Loaded at the Ports (metric tons) in Cebu City



Figure 10. Total Annual Value of Foreign Trade (million USD) in Cebu City

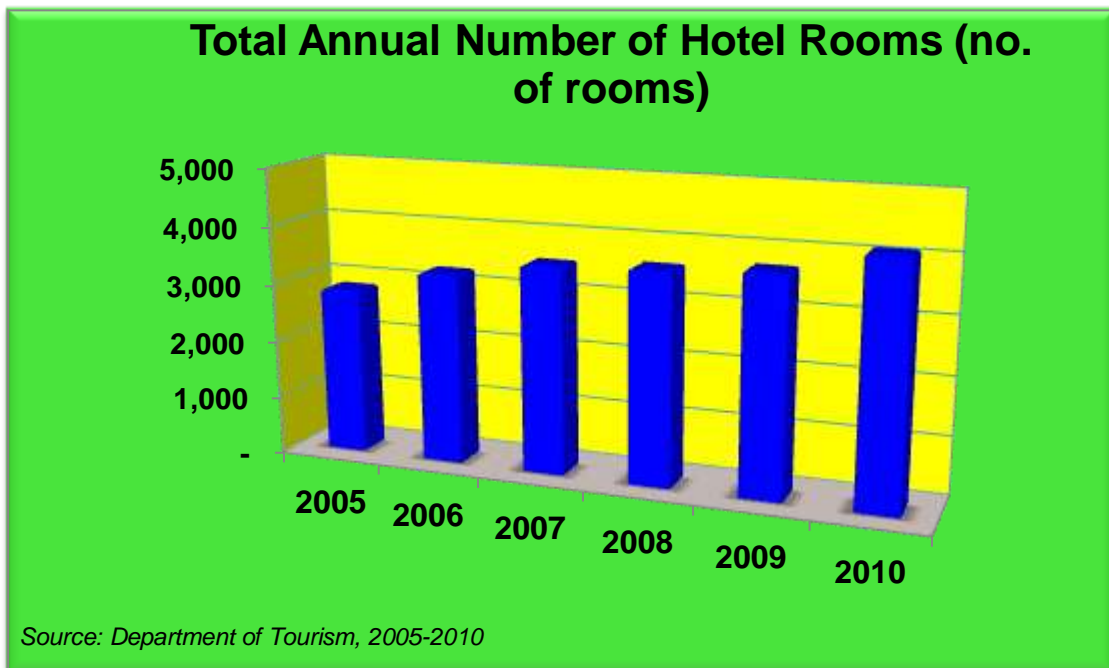


Figure 11. Total Annual Number of Hotel Rooms (no. of rooms) in Cebu City

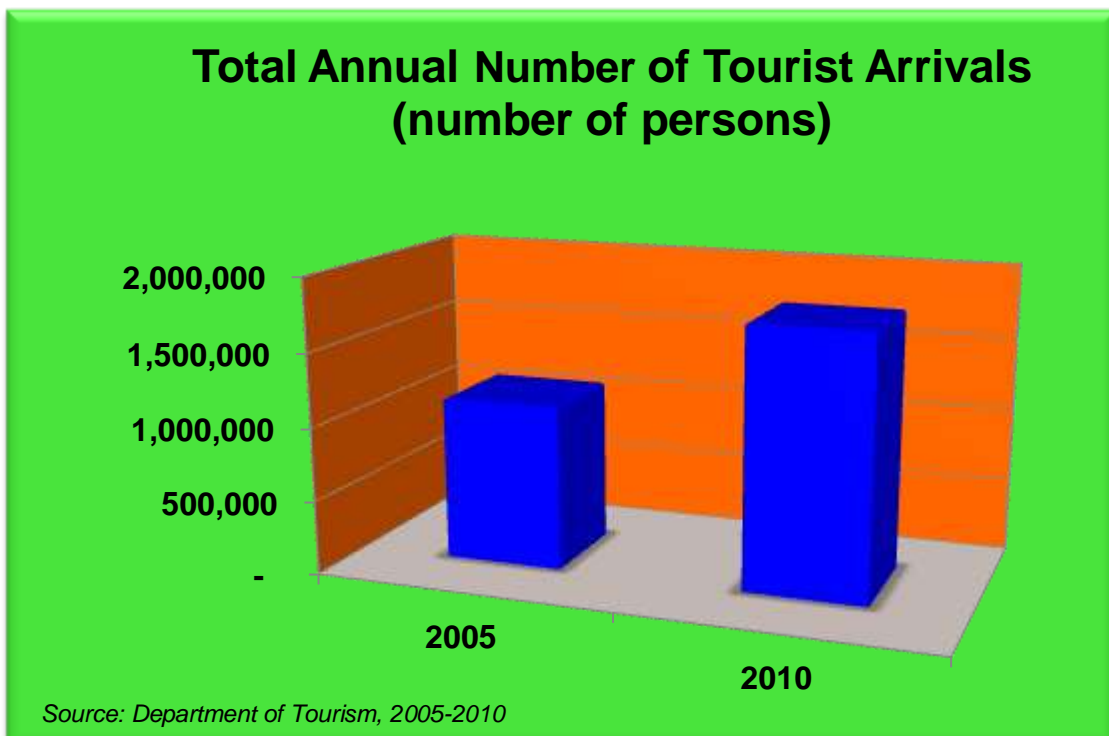


Figure 12. Total Annual Number of Tourist Arrivals (no. of persons) in Cebu City

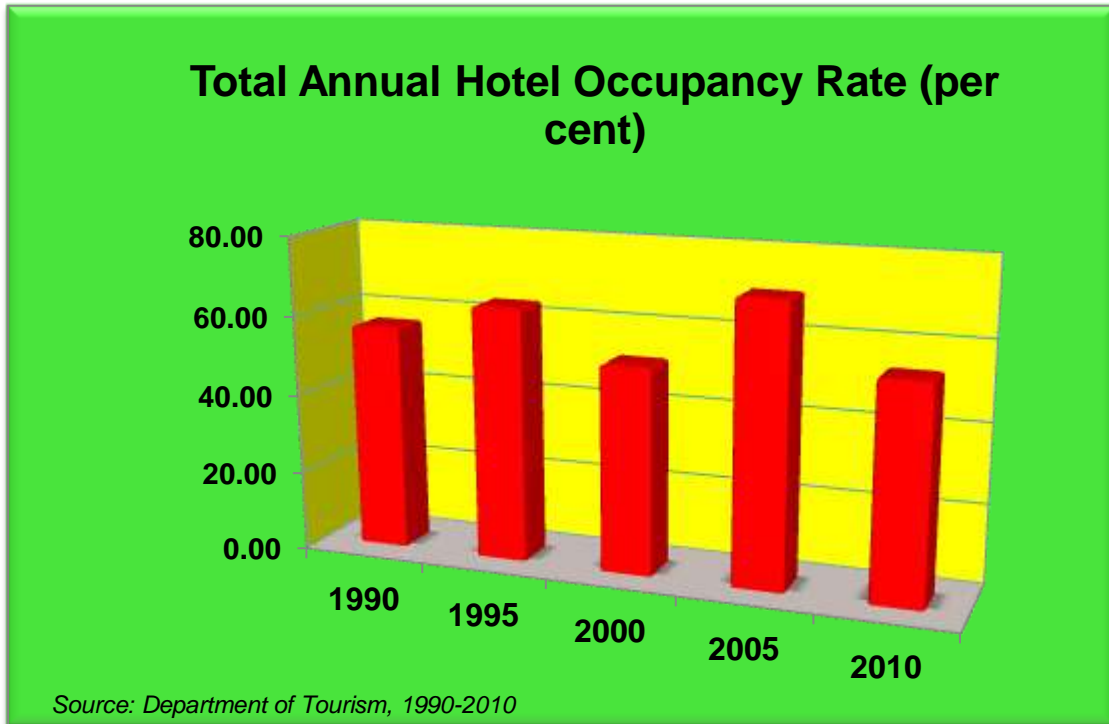


Figure 13. Total Annual Hotel Occupancy Rate (per cent) in Cebu City

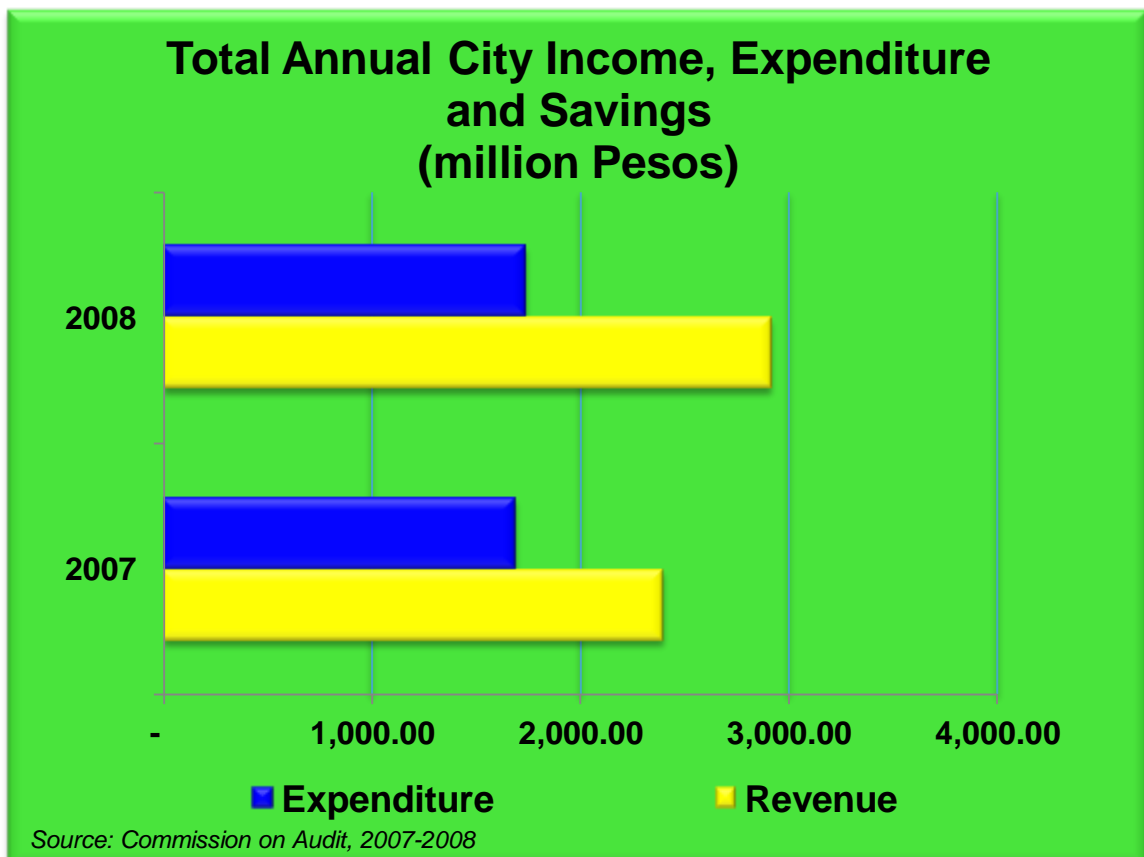


Figure 14. Total Annual City Income, Expenditure and Savings (million Pesos) in Cebu City

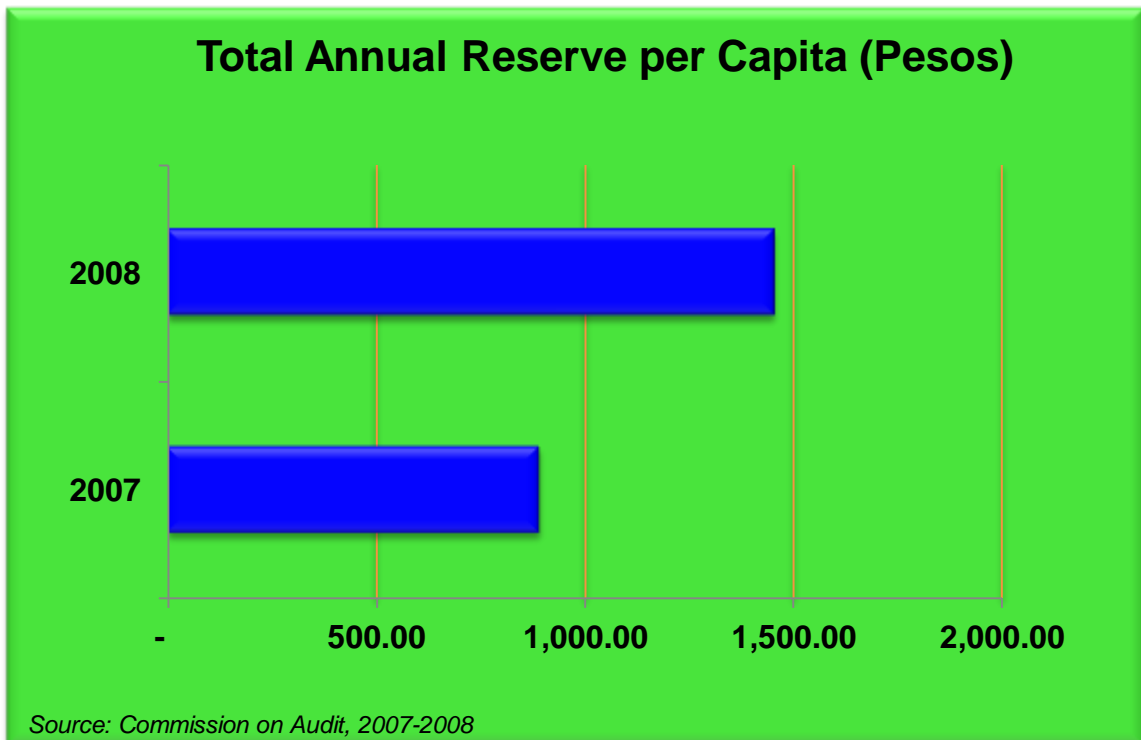


Figure 15. Total Annual Reserve per Capita (Pesos) in Cebu City

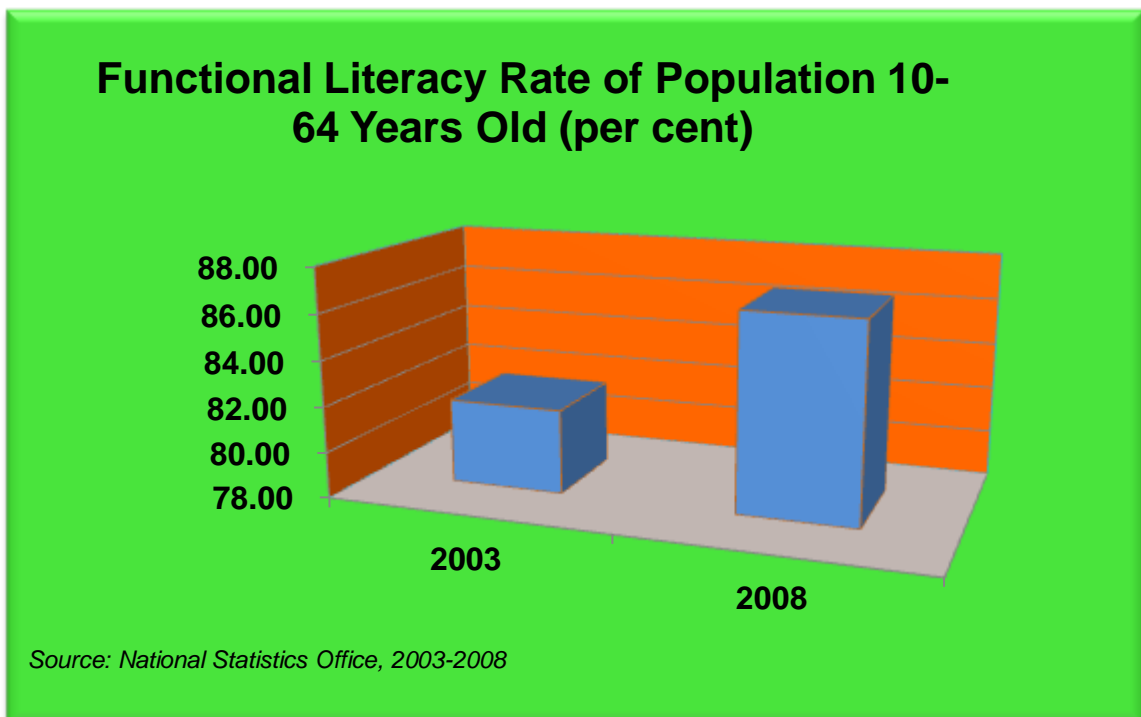


Figure 16. Functional Literacy Rate of Population 10-64 Years old (percent) in Cebu City

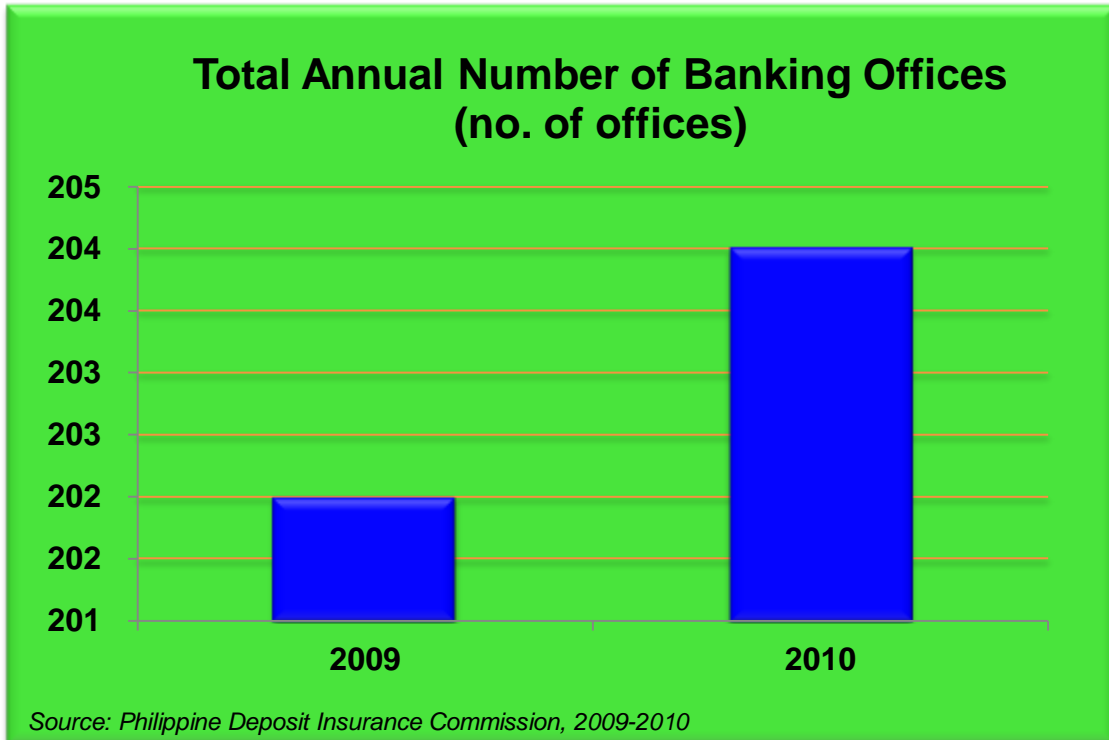


Figure 17. Total Annual Number of Banking Offices (no. of offices) in Cebu City

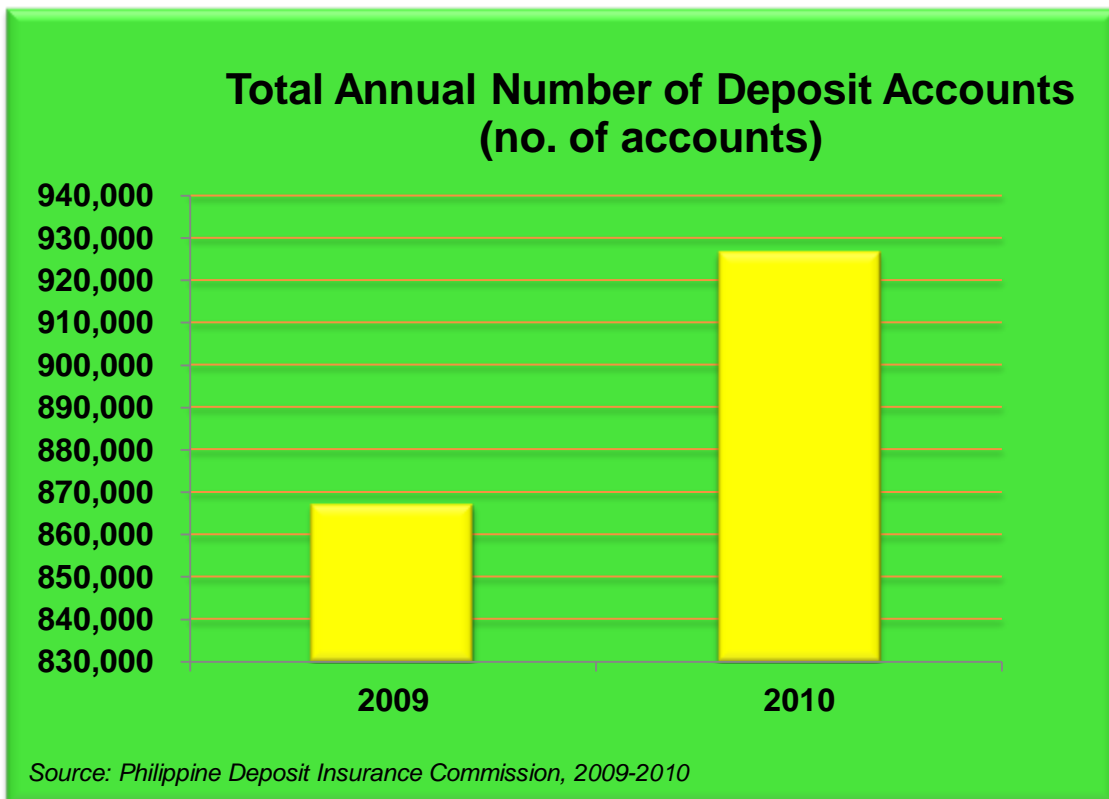


Figure 18. Total Annual Number of Deposit Accounts (no. of accounts) in Cebu City

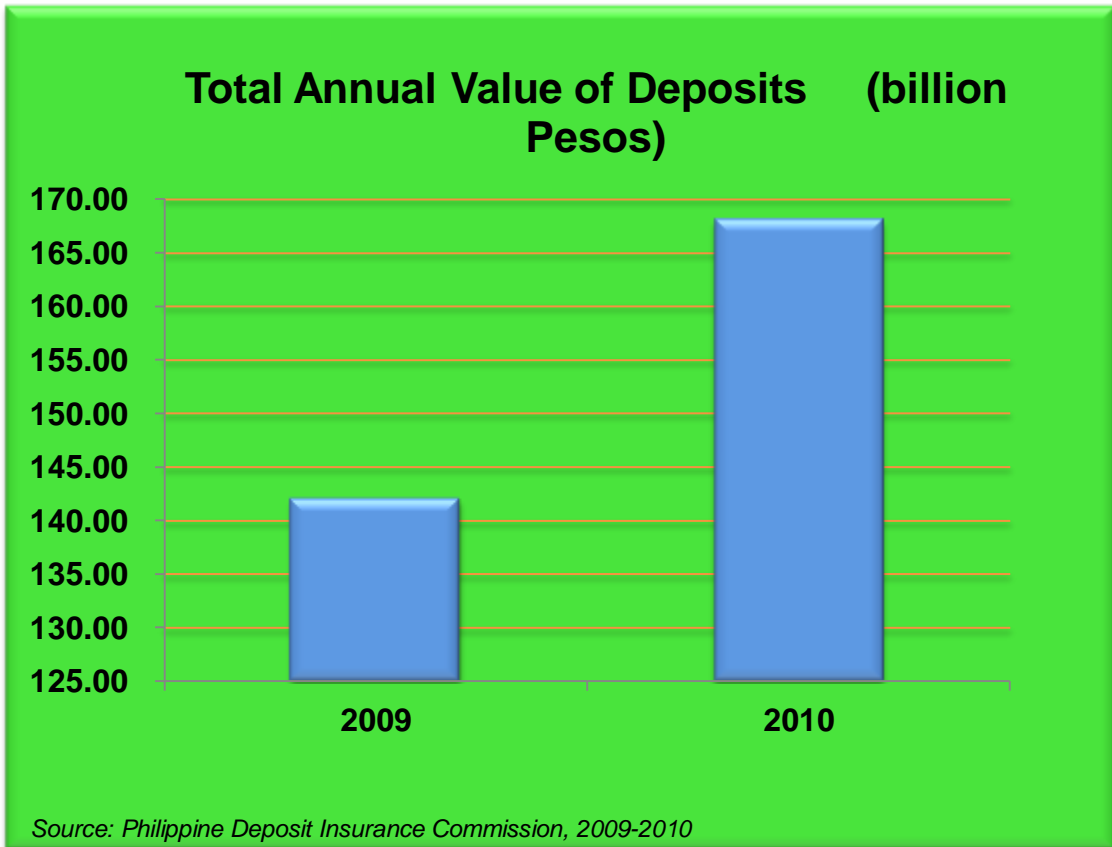


Figure 19. Total Annual Value of Deposits (billion Pesos) in Cebu City

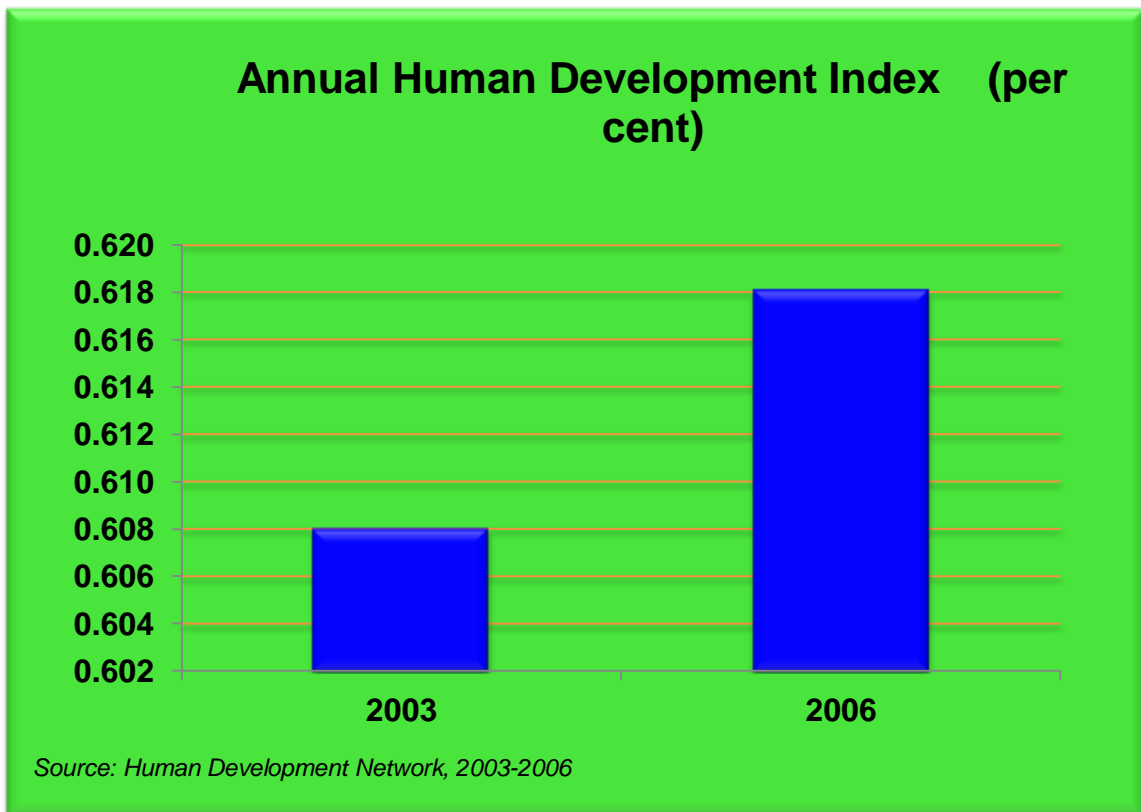


Figure 20. Total Annual Human Development Index (percent) in Cebu City



### Annex 3. Davao City

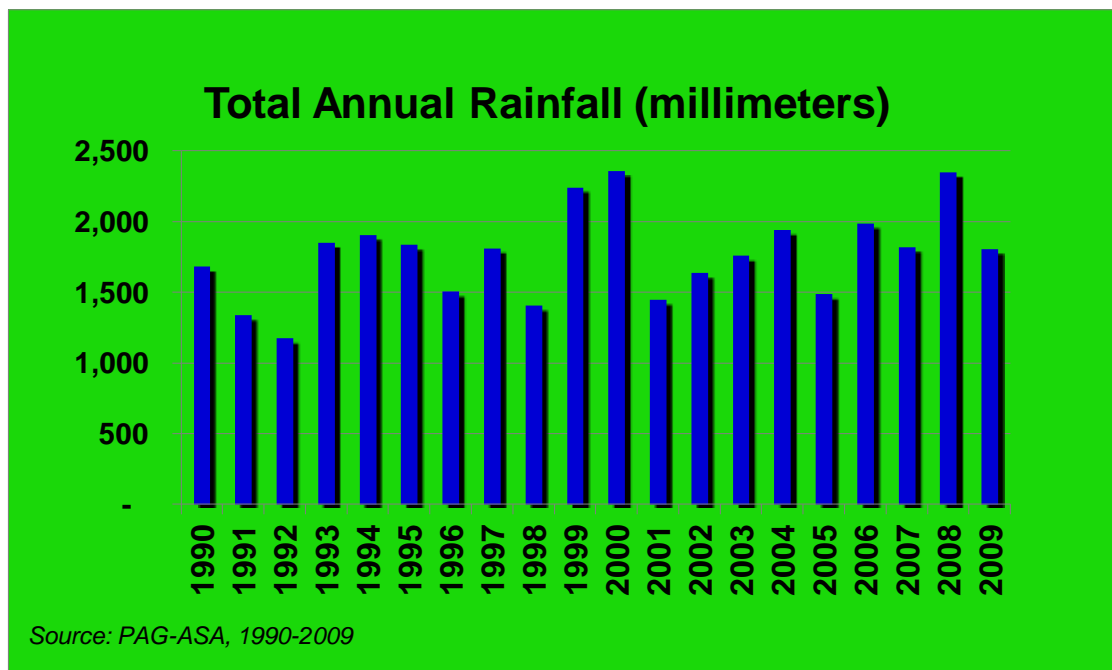


Figure 1. Total Rainfall Amount (mm) in Davao City

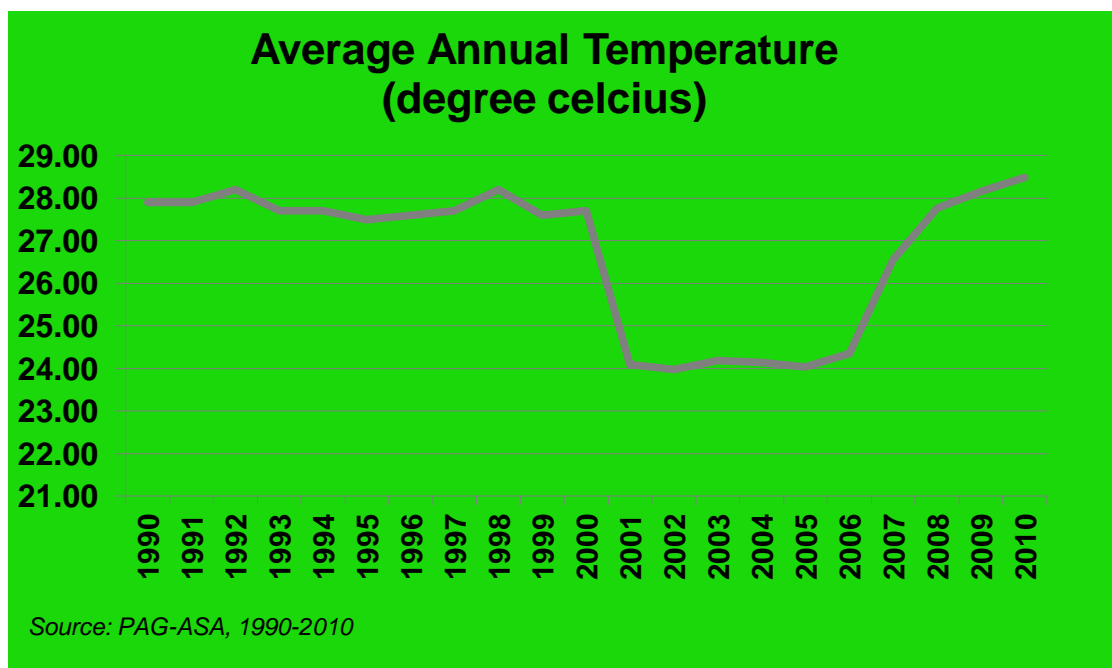


Figure 2. Average Annual Temperature (degree Celsius) in Davao City

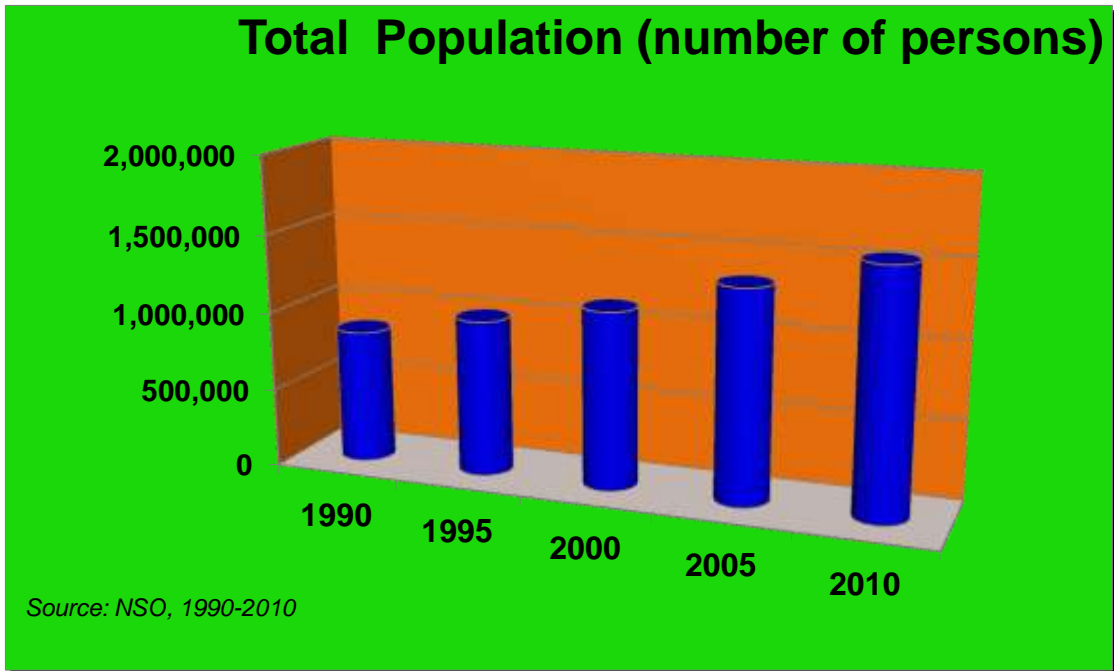


Figure 3. Total Population (number of persons) in Davao City

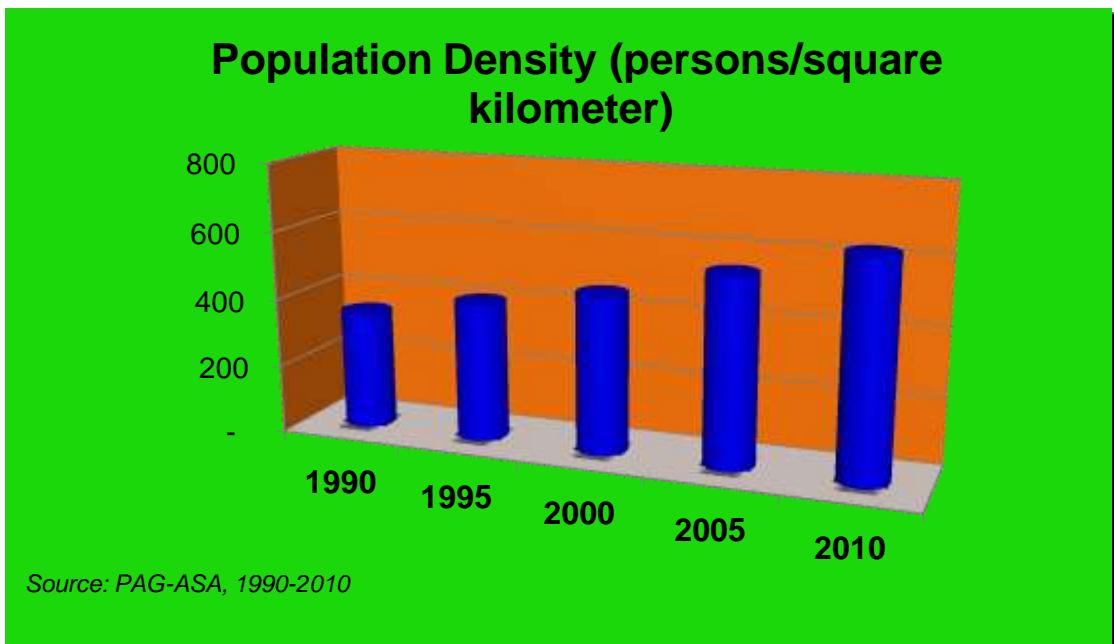


Figure 4. Population Density (number of persons/square kilometer in Davao City

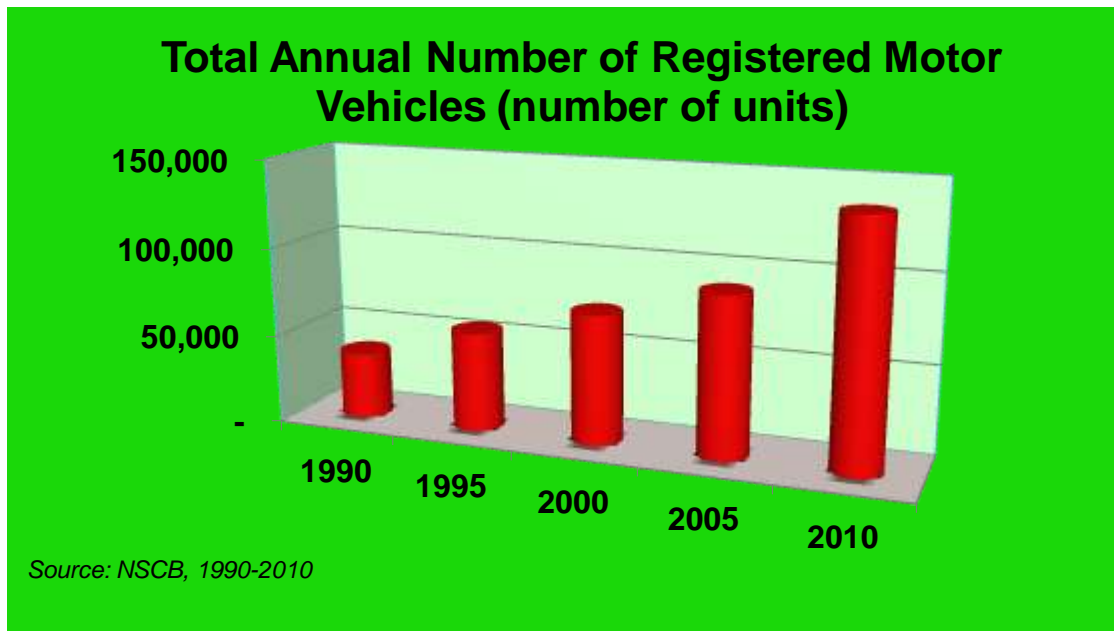


Figure 5. Total Annual Number of Registered Motor Vehicles (number of units) in Davao City

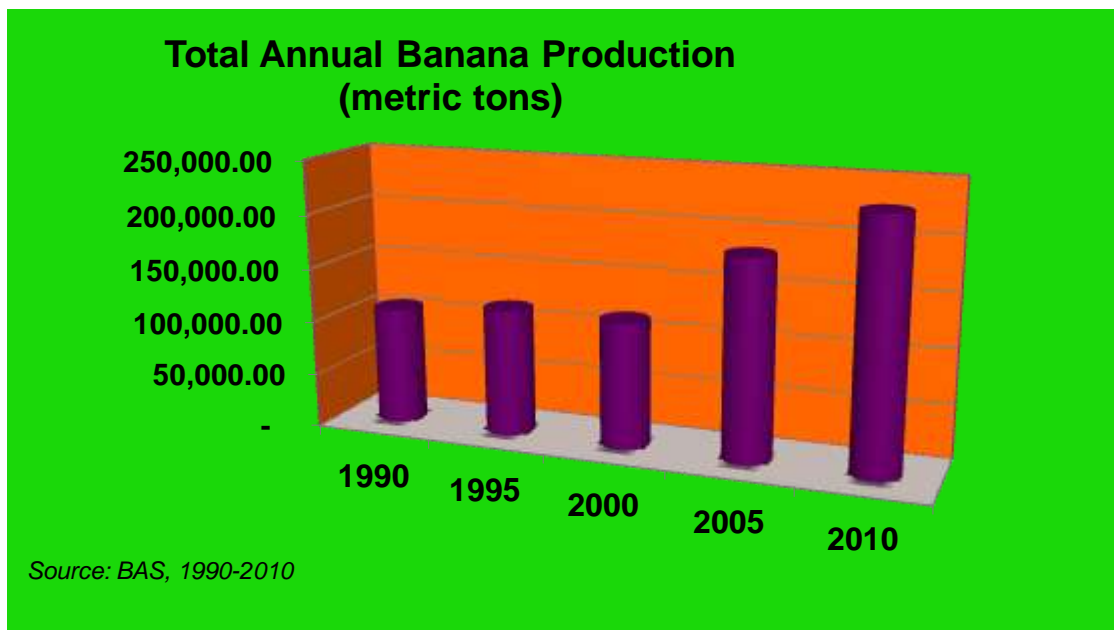


Figure 6. Total Annual Banana Production (metric tons) in Davao City

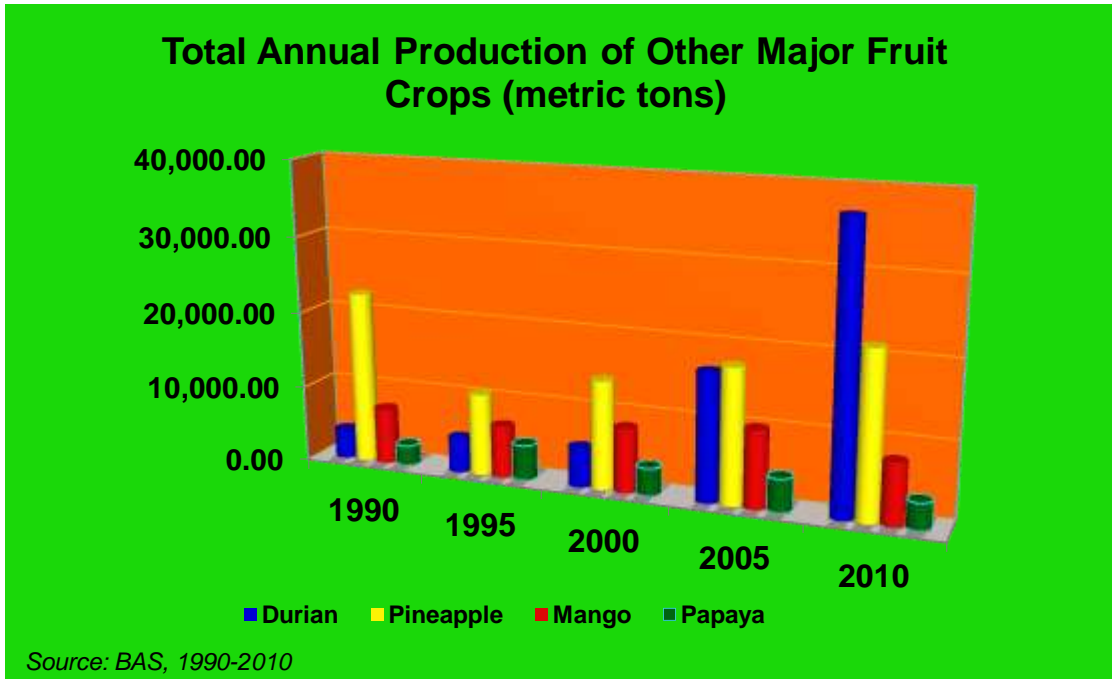


Figure 7. Total Annual Production of Other Major Fruit Crops (metric tons) in Davao City

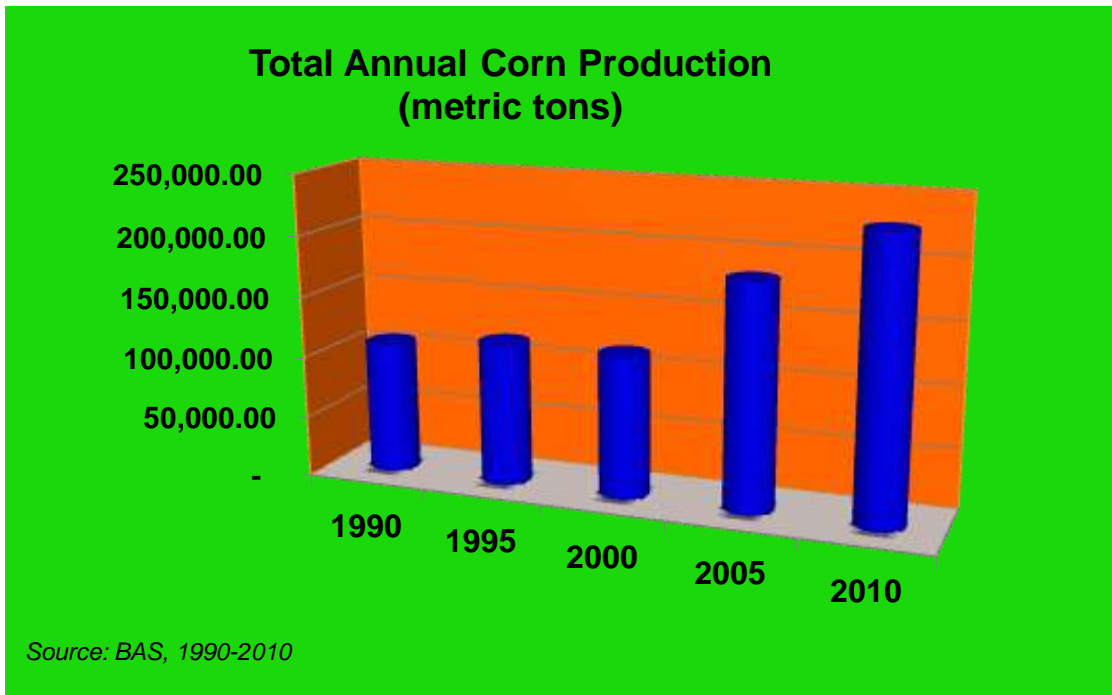


Figure 8. Total Annual Corn Production (metric tons) in Davao City

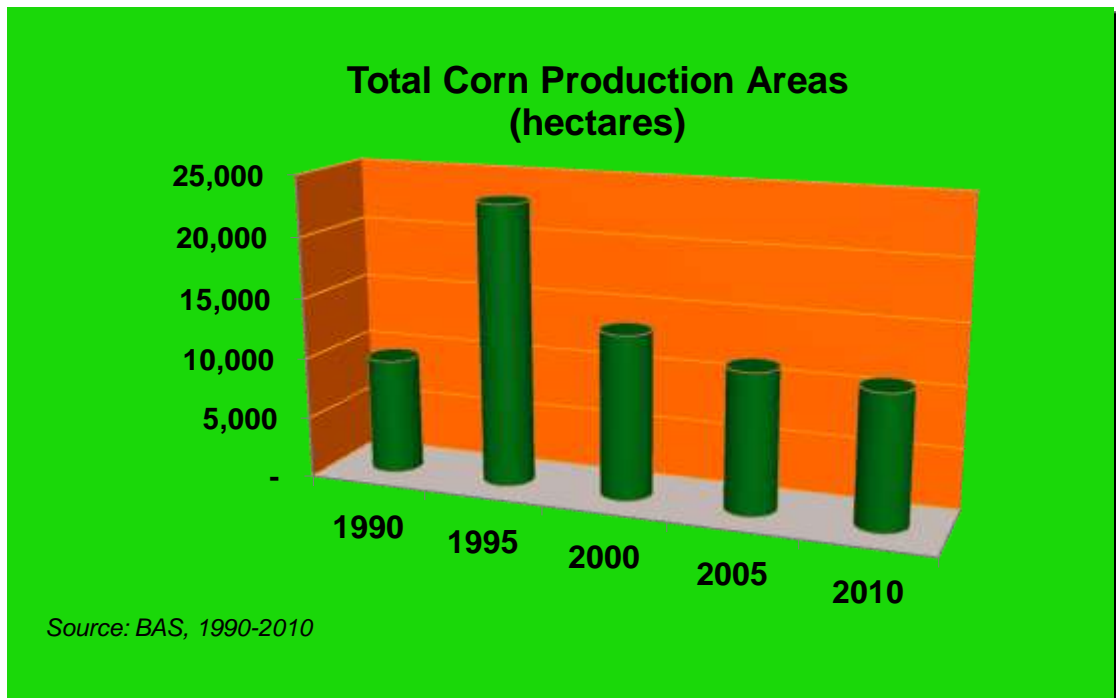


Figure 9. Total Corn Production Areas (hectares) in Davao City

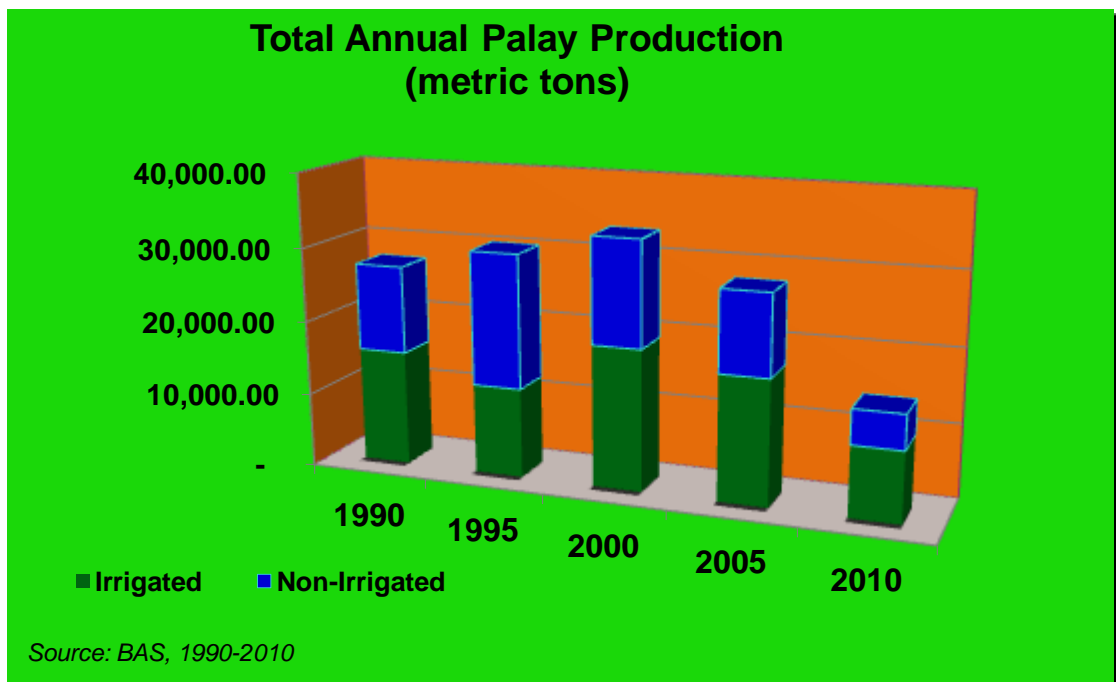


Figure 10. Total Annual Palay Production (metric tons) in Davao City

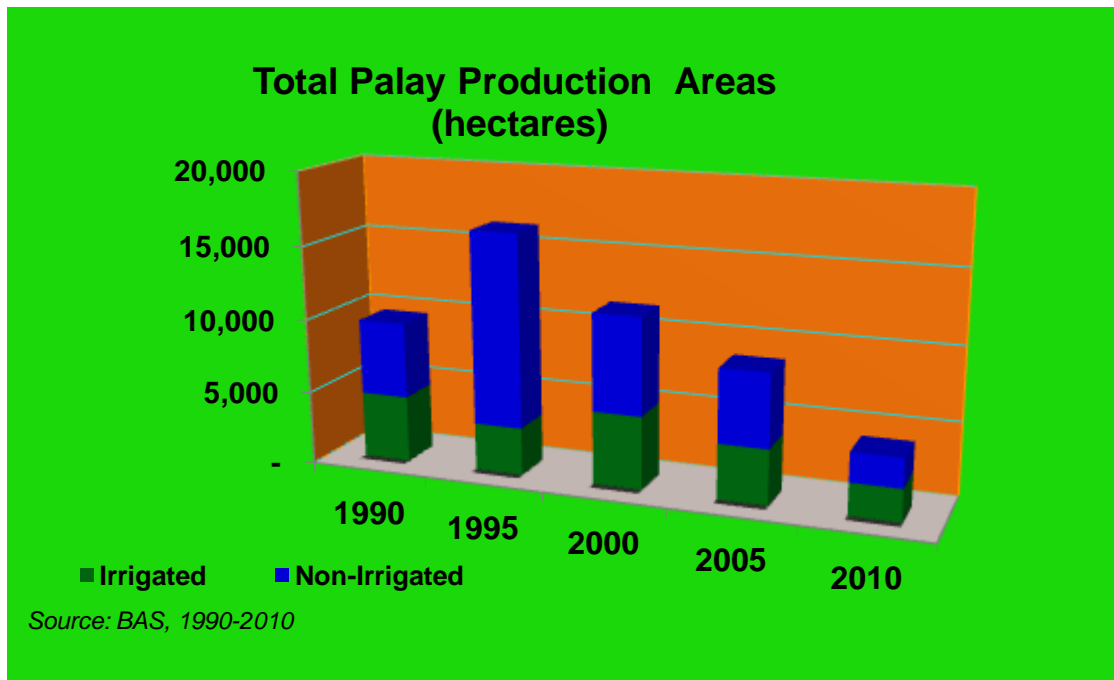


Figure 11. Total Palay Production Areas (hectares) in Davao City

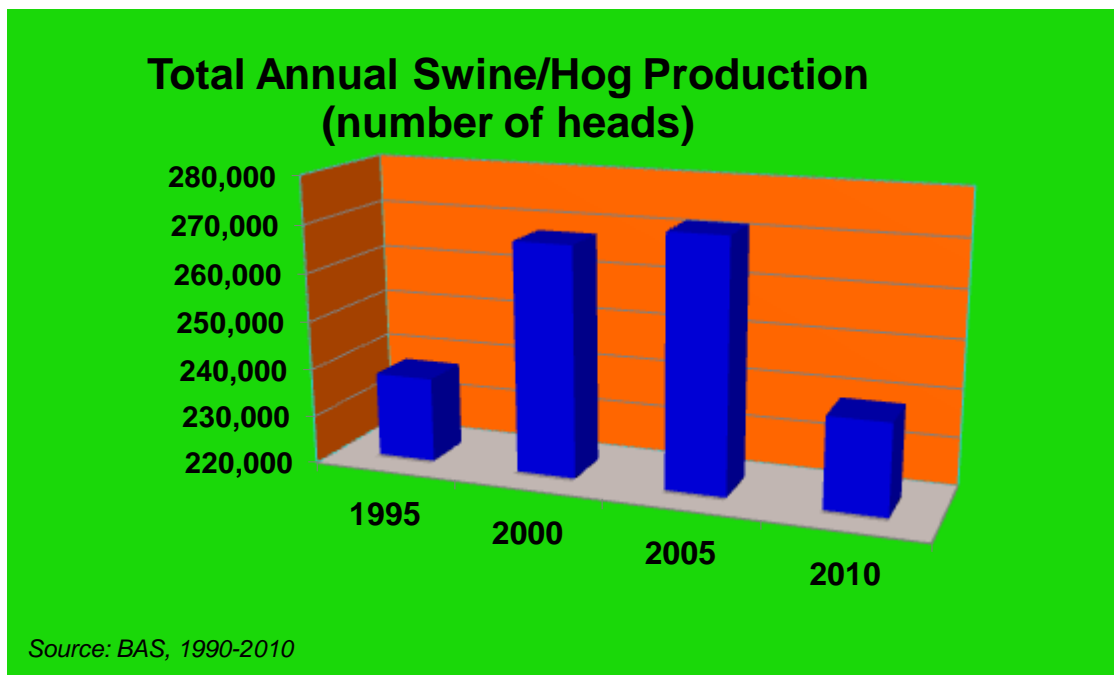


Figure 12. Total Annual Swine/Hog Production (number of heads) in Davao City

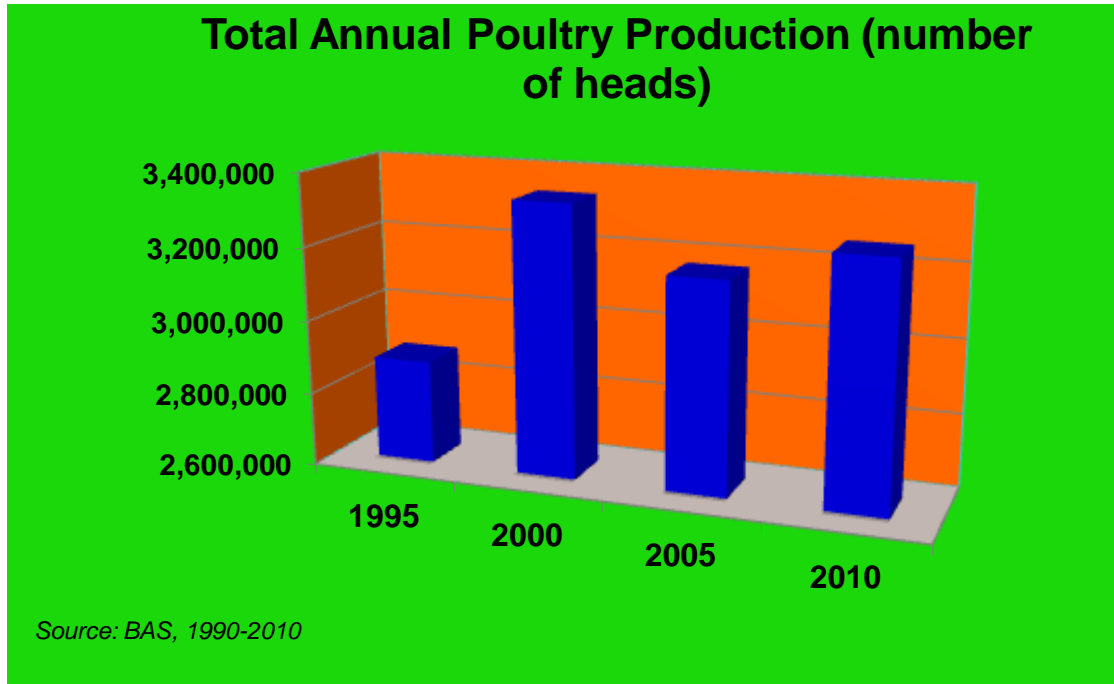


Figure 13. Total Annual Poultry Production (number of heads) in Davao City

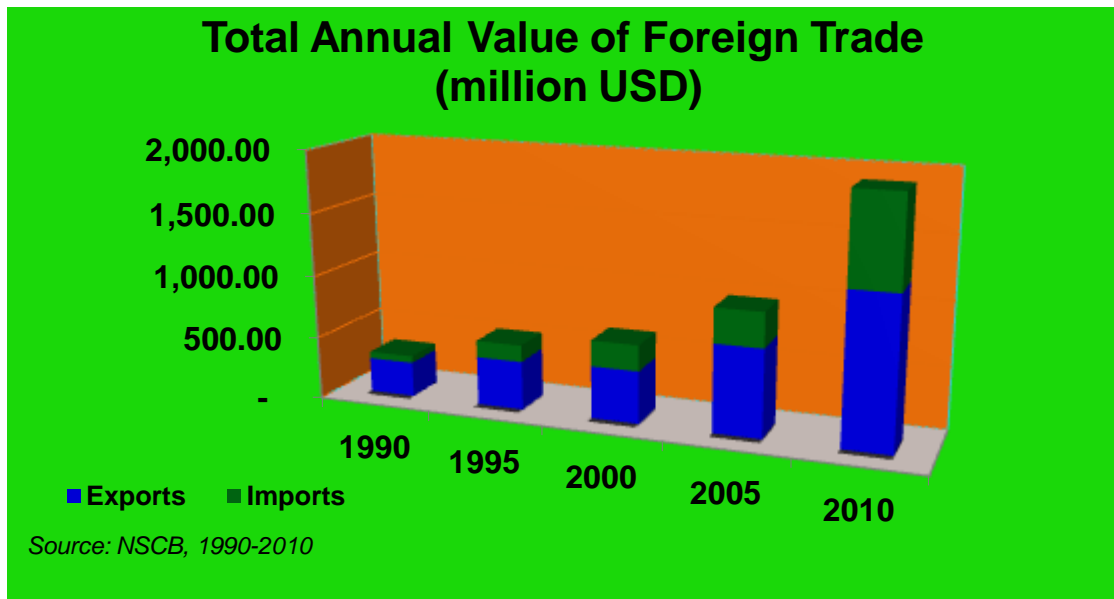


Figure 14. Total Annual Value of Foreign Trade (million USD) in Davao City

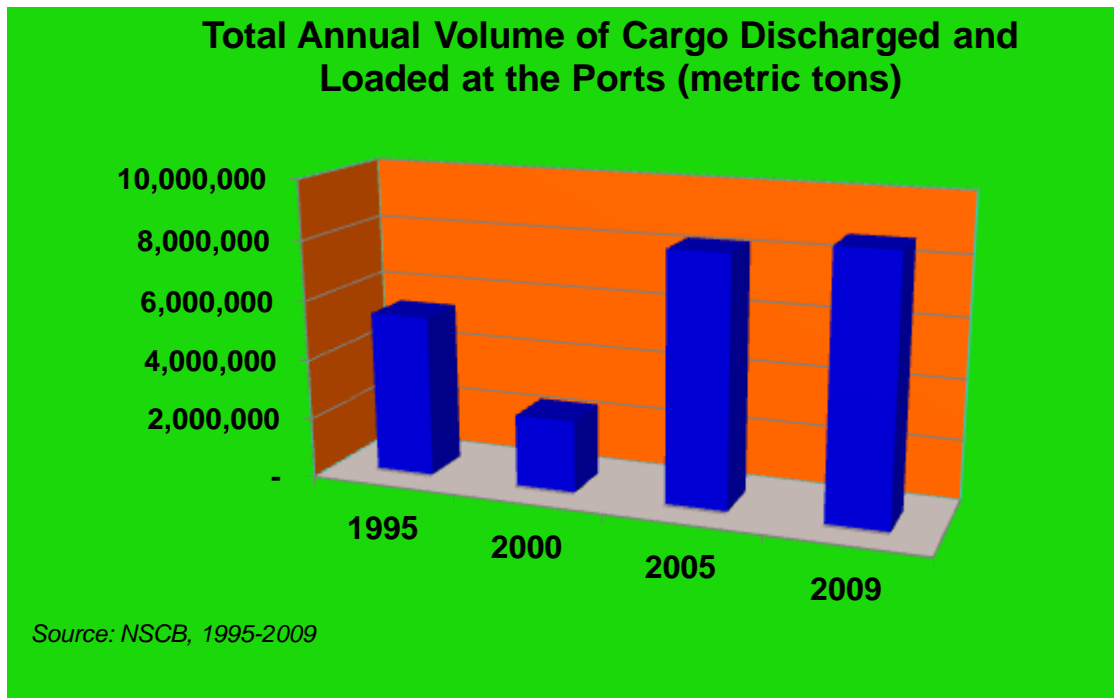


Figure 15. Total Annual Volume of Cargo Discharged and Loaded at the Ports (metric tons) in Davao City

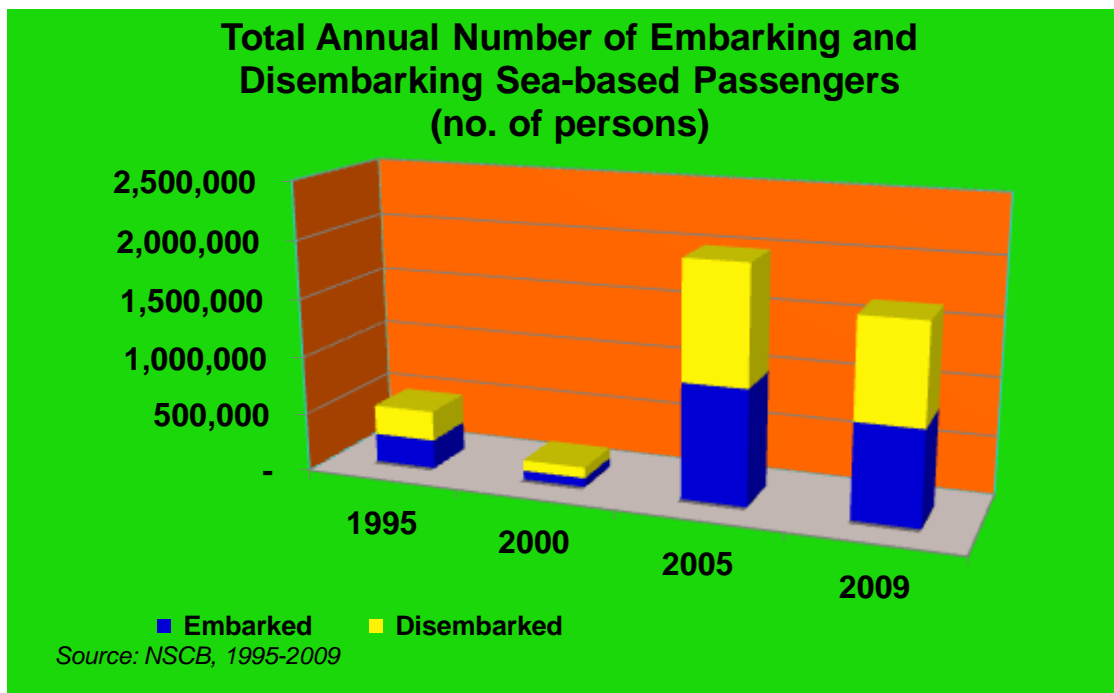


Figure 16. Total Annual Number of Embarking and Disembarking Sea-based Passengers (number of persons) in Davao City

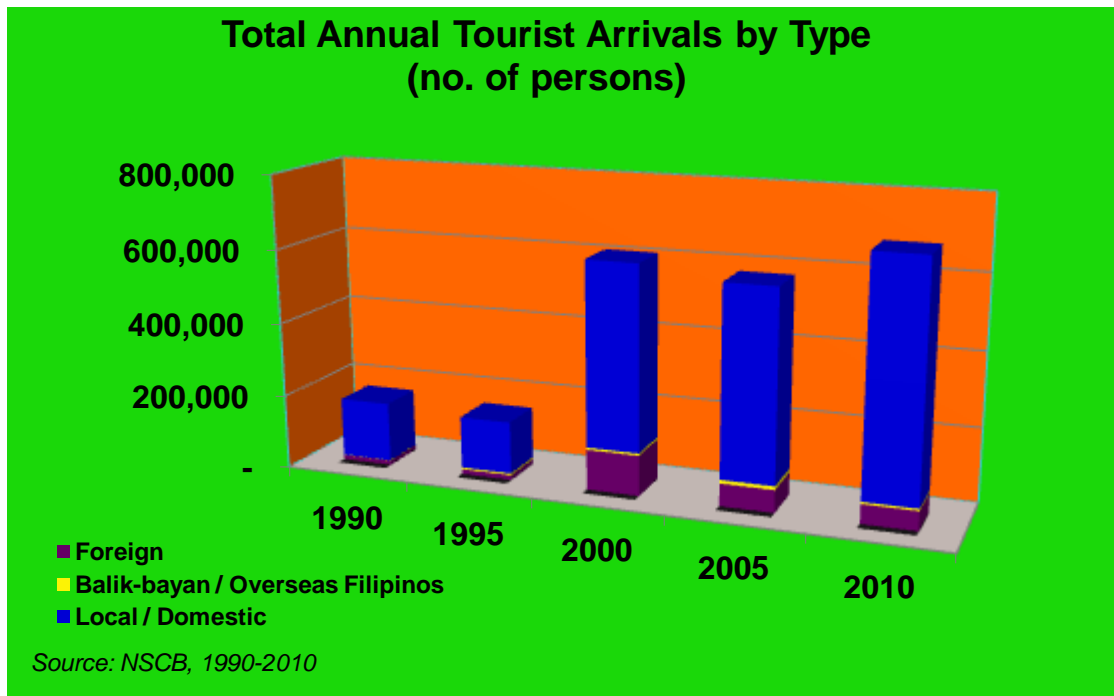


Figure 17. Total Annual Tourist Arrivals by Type (number of persons) in Davao City

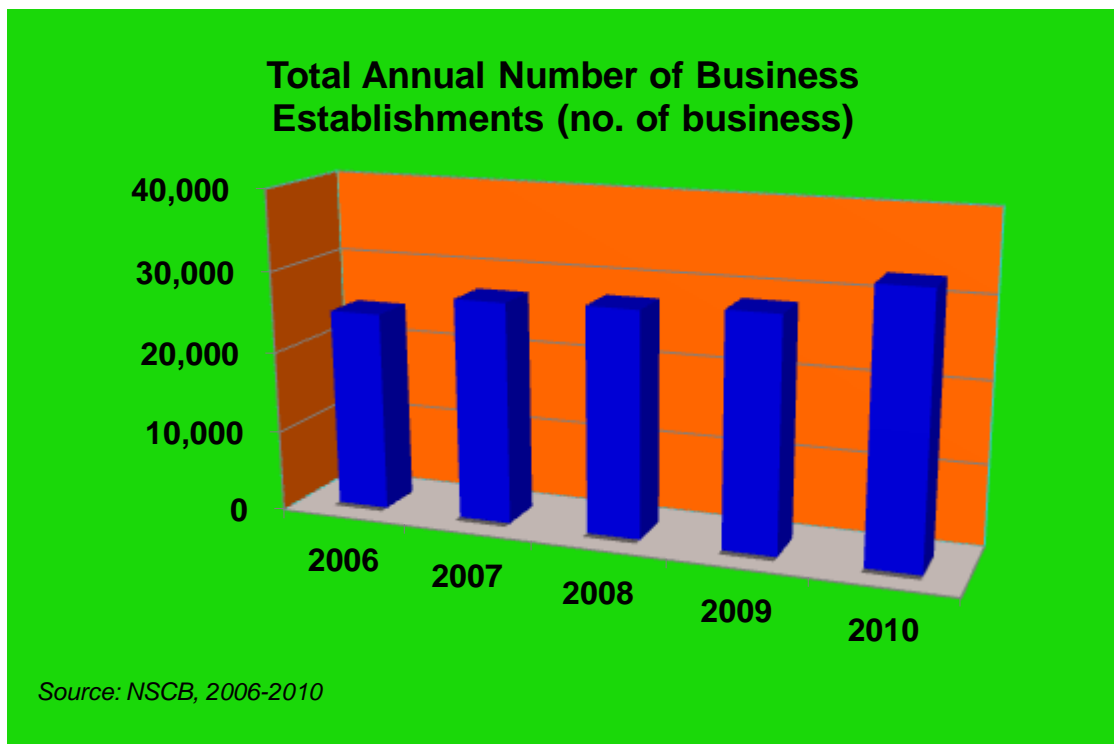


Figure 18. Total Annual Number of Business Establishments (number of businesses) in Davao City

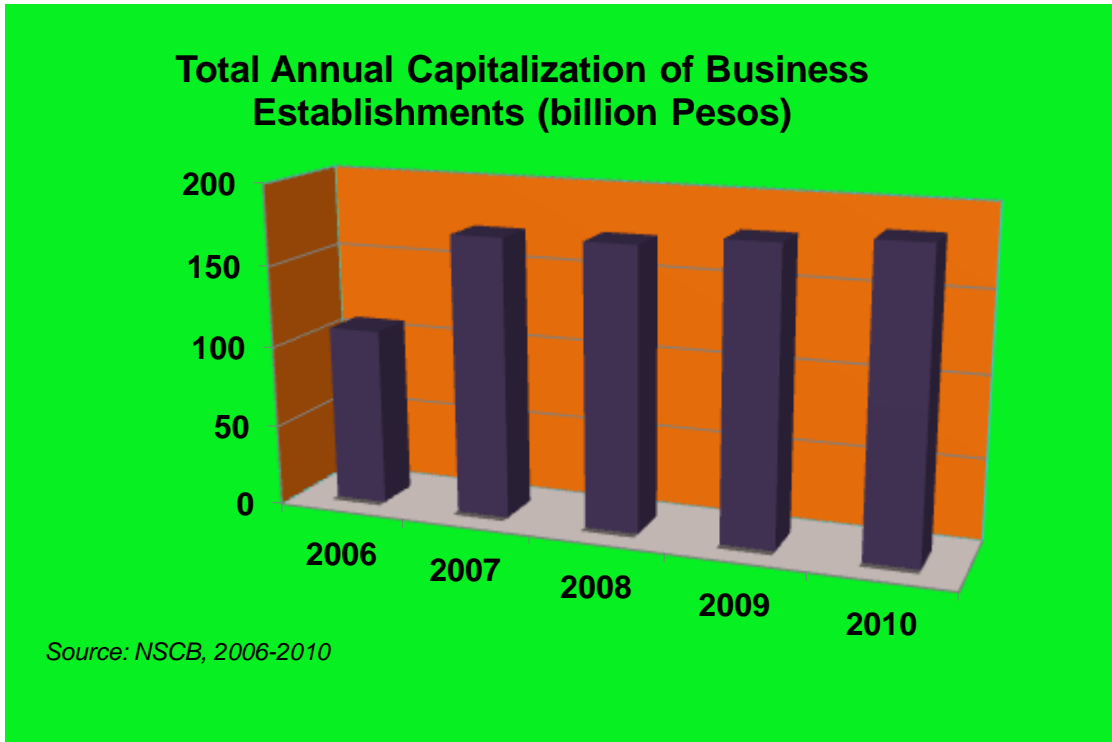


Figure 19. Total Annual Capitalization of Business Establishments (billion Pesos) in Davao City

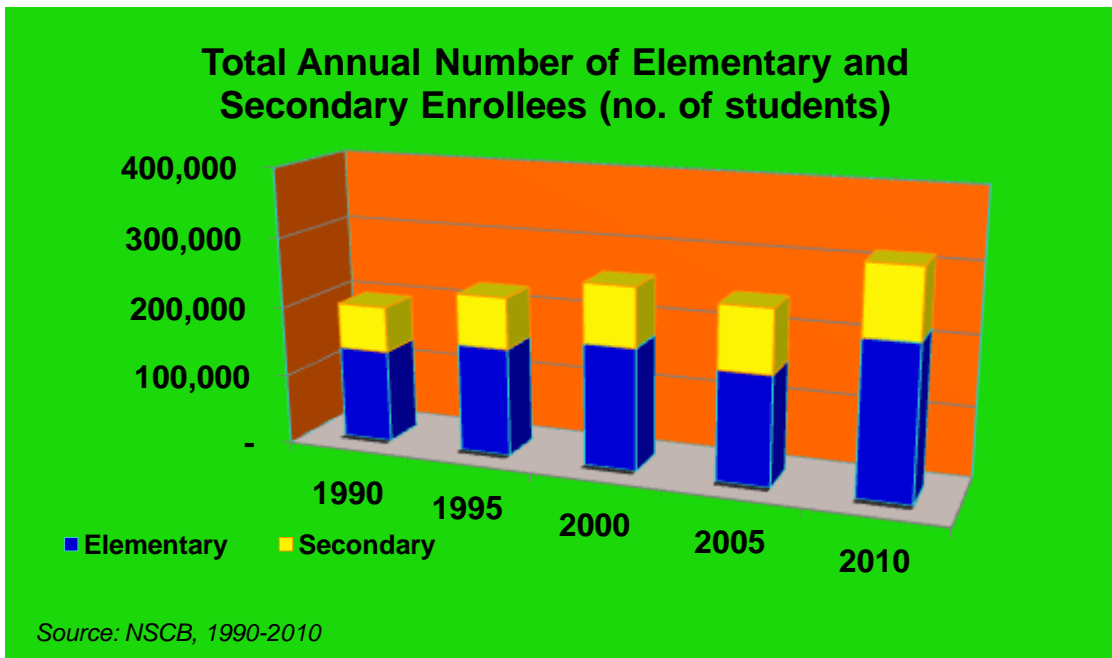


Figure 20. Total Annual Number of Elementary and Secondary Enrollees (no. of students) in Davao City

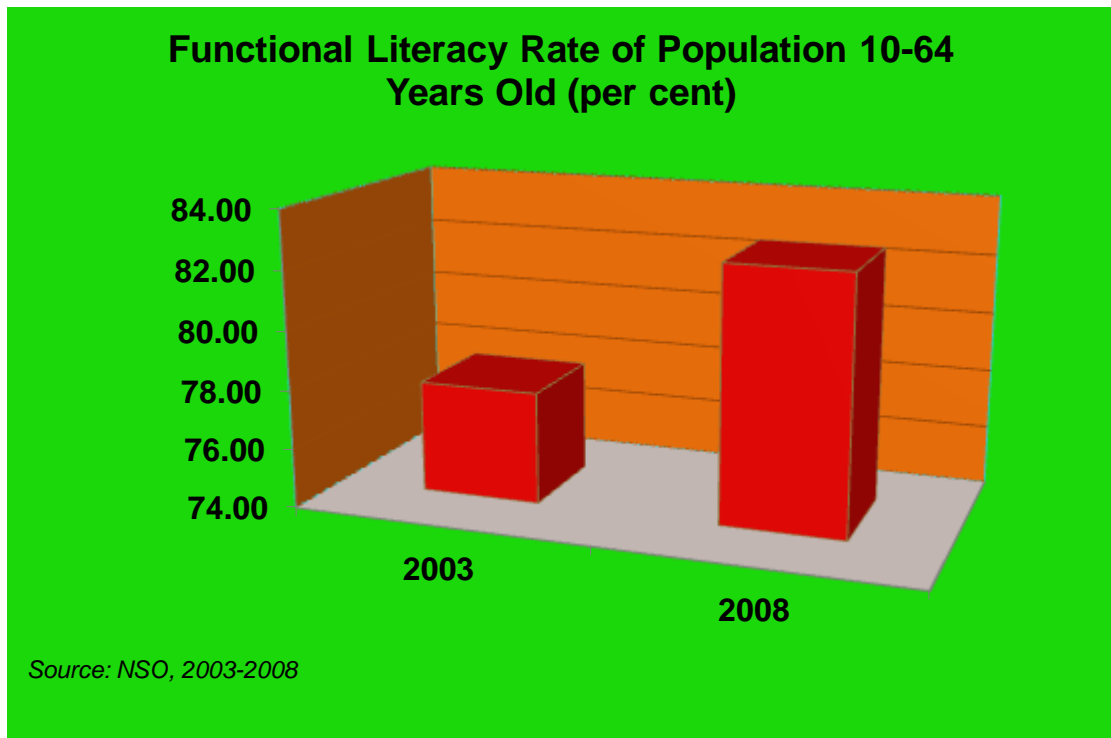


Figure 21. Functional Literacy Rate of Population 10-64 Years Old (per cent) in Davao City

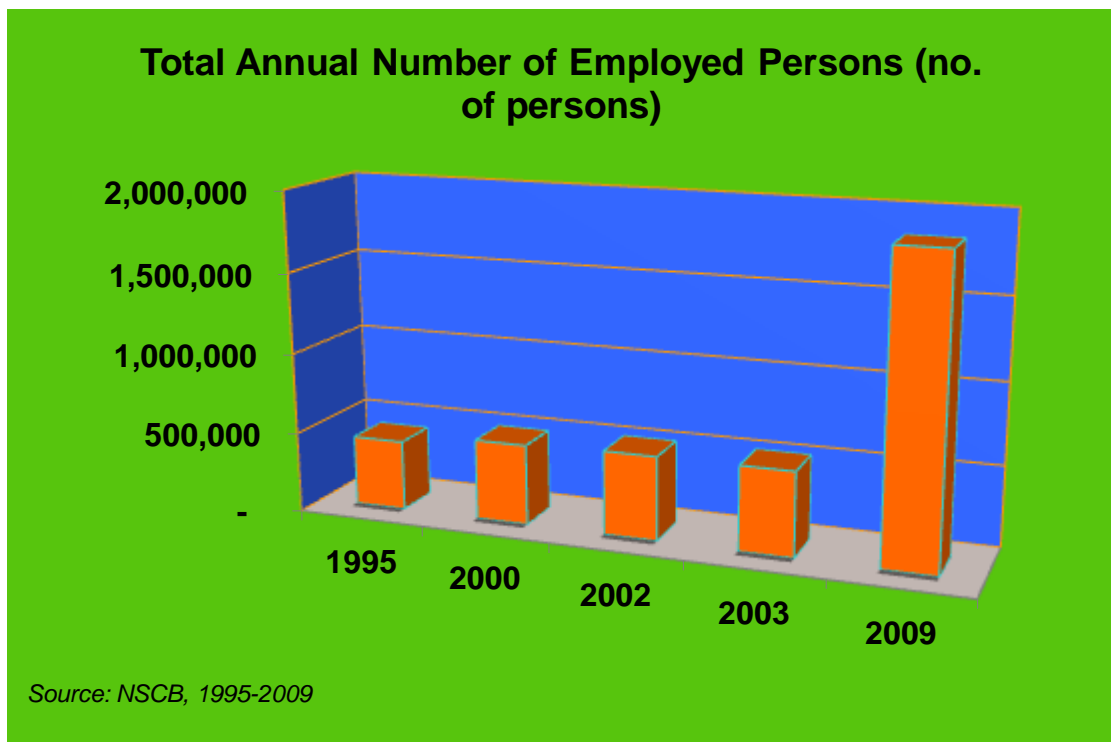


Figure 22. Total Annual Number of Employed Persons (number of persons) in Davao City

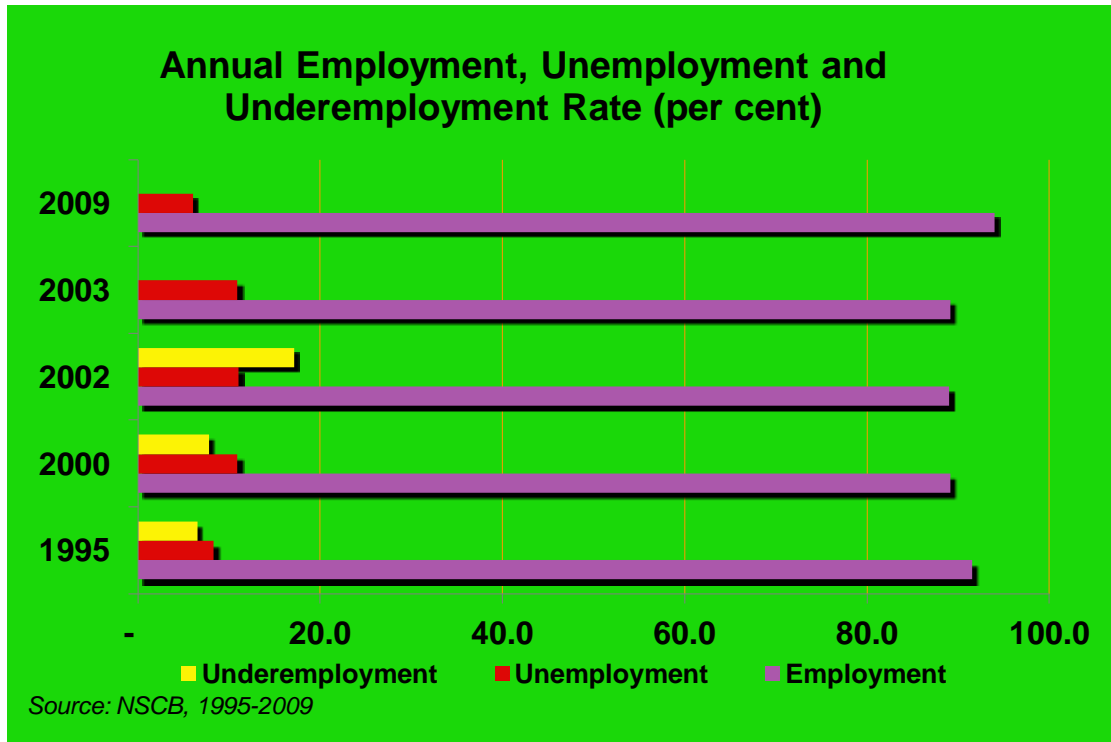


Figure 23. Annual Employment, Unemployment and Underemployment Rate (per cent) in Davao City

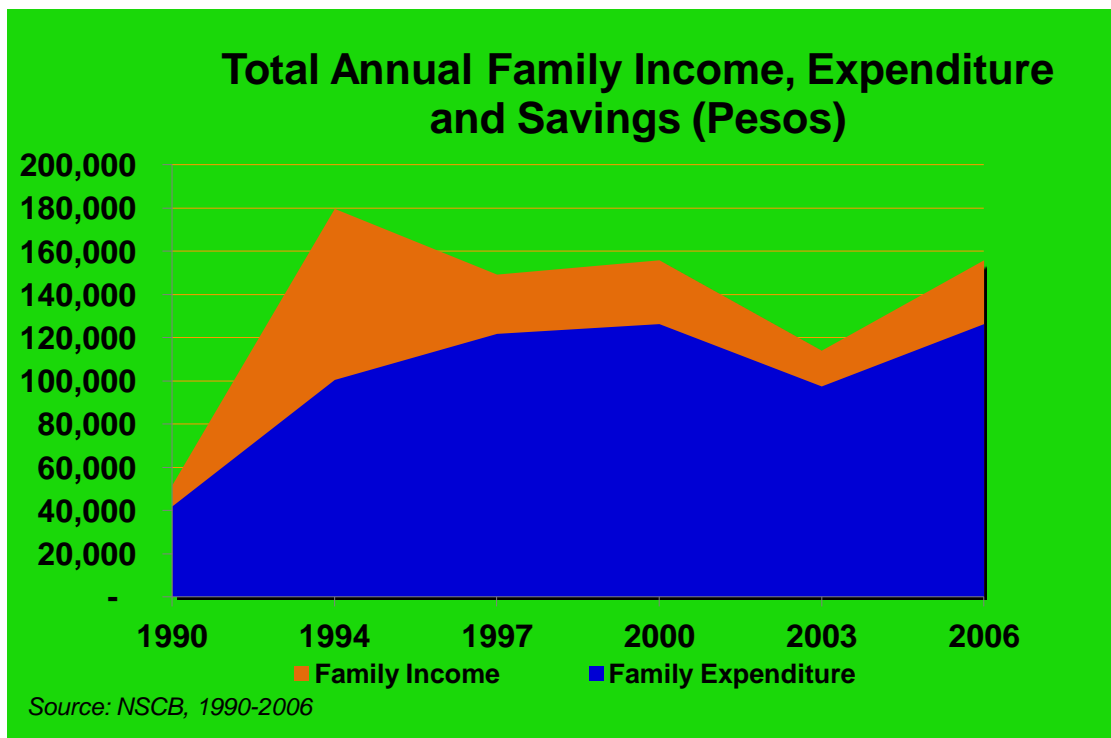


Figure 24. Total Annual Family Income, Expenditure and Savings (Pesos) in Davao City

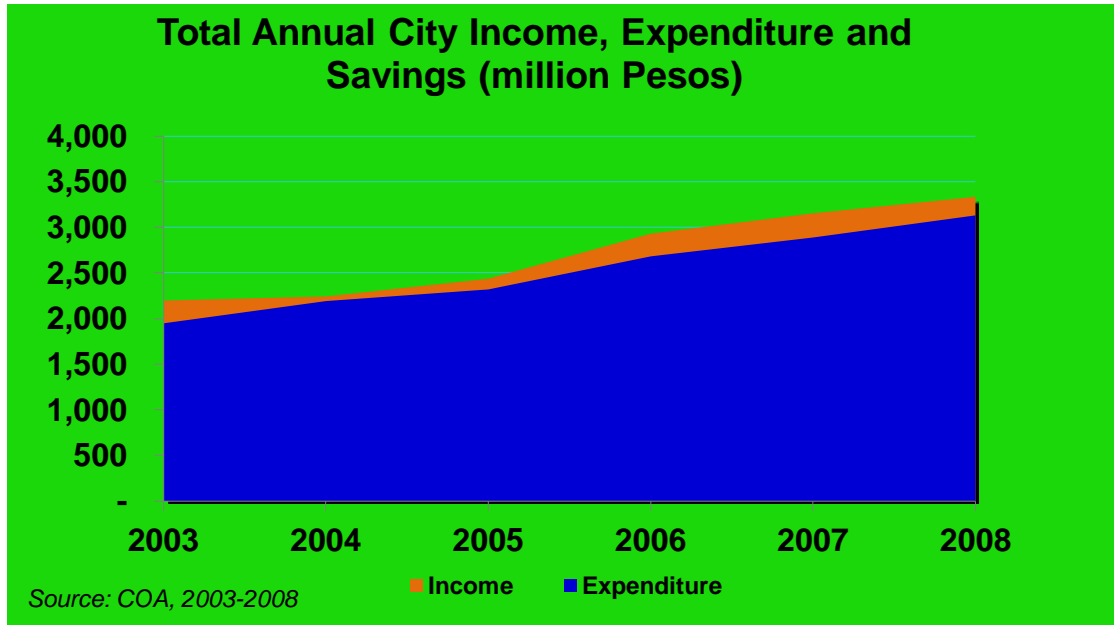


Figure 25. Total Annual City Income, Expenditure and Savings (million Pesos)

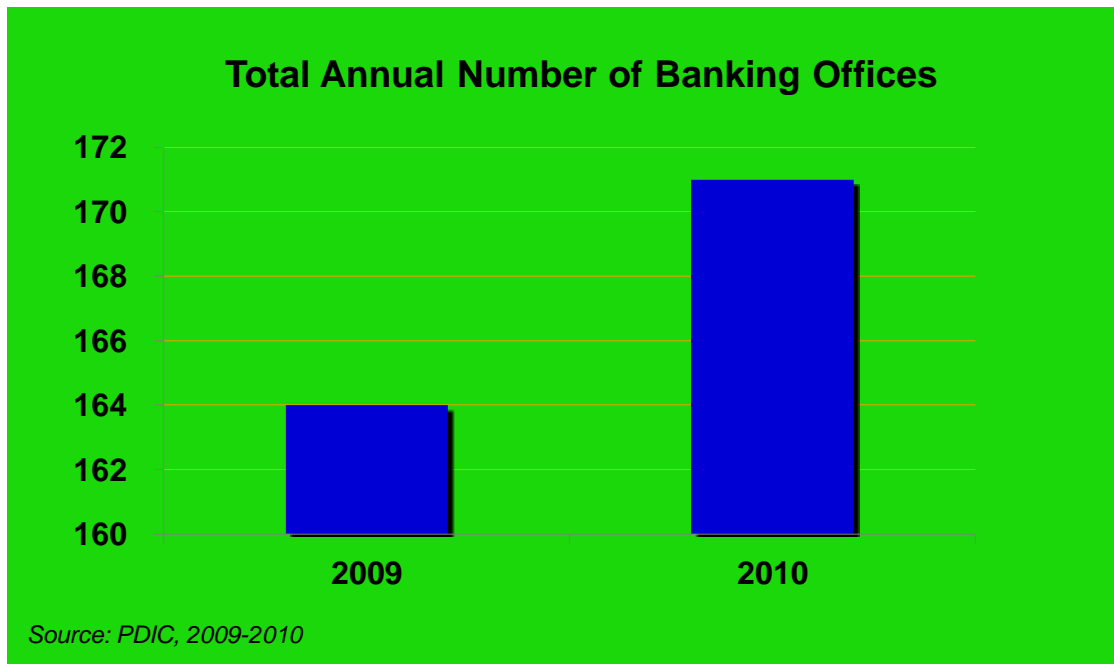


Figure 26. Total Annual Number of Banking Offices in Davao City

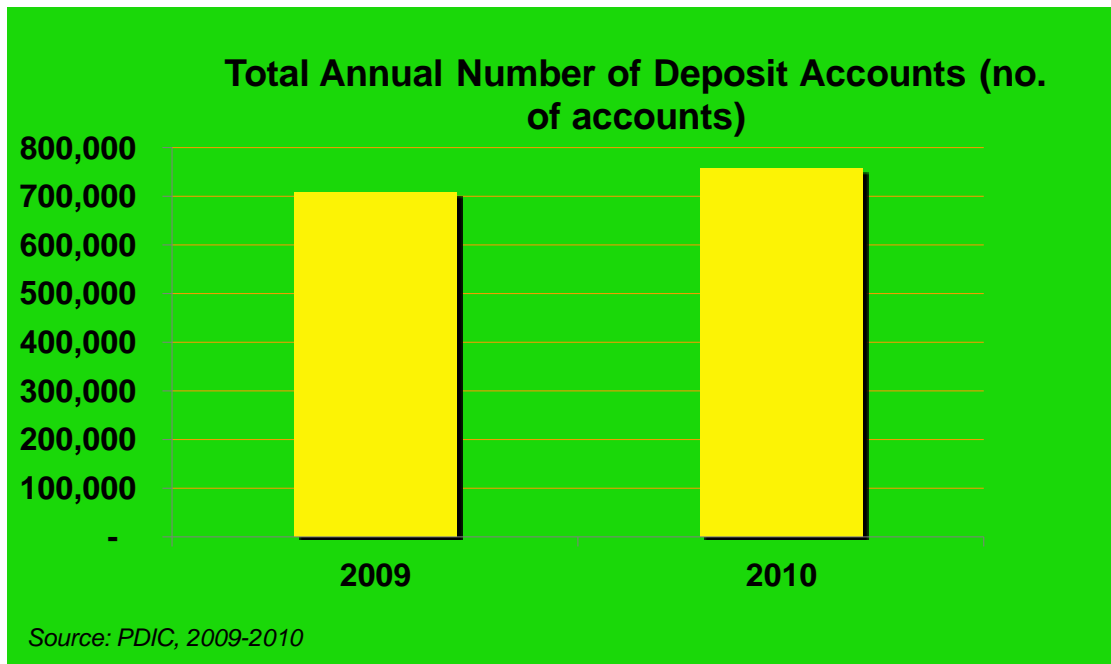


Figure 27. Total Annual Number of Deposit Accounts (no. of accounts) in Davao City

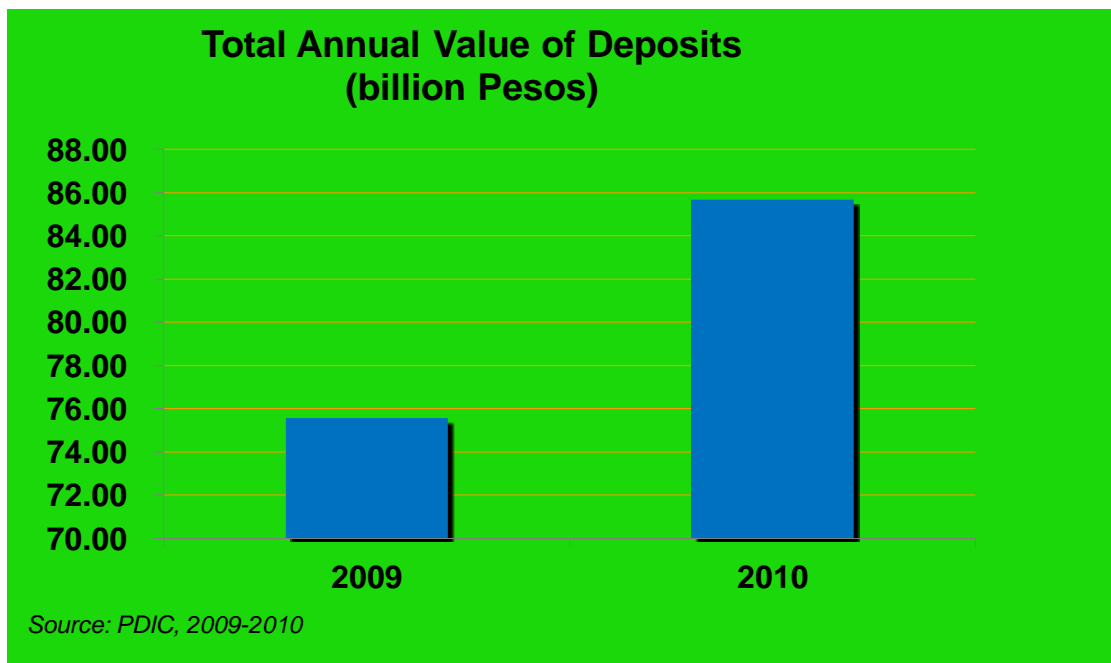


Figure 28. Total Annual Value of Deposits (billion pesos) in Davao City

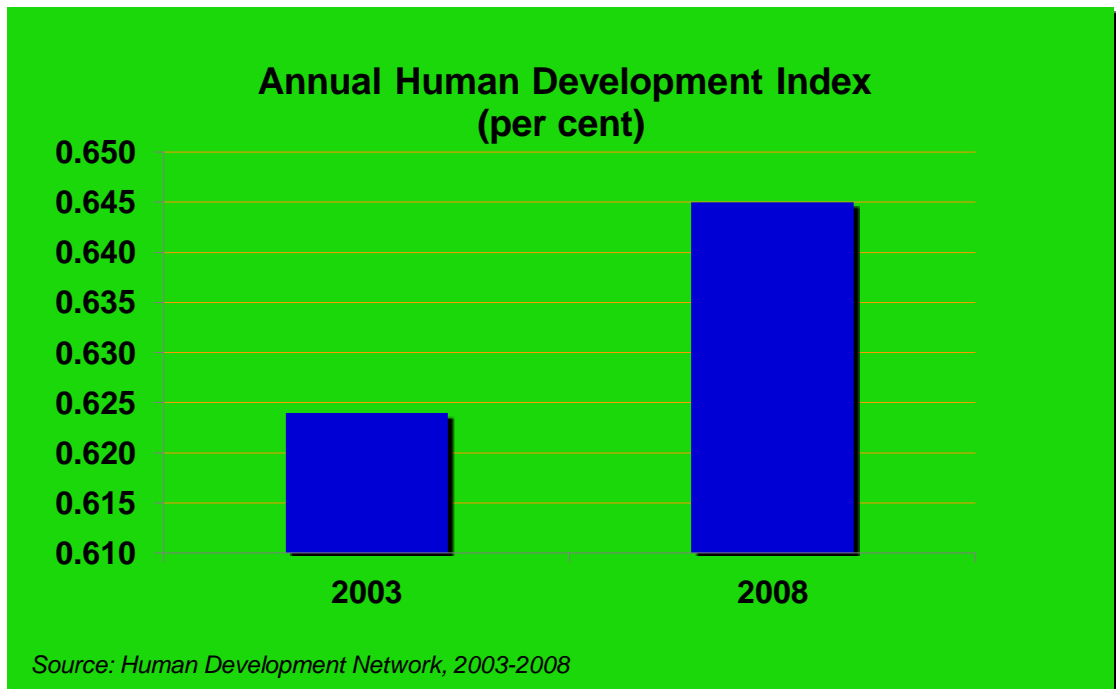


Figure 29. Annual Human Development Index (per cent) in Davao City

## Annex 4. Iloilo City

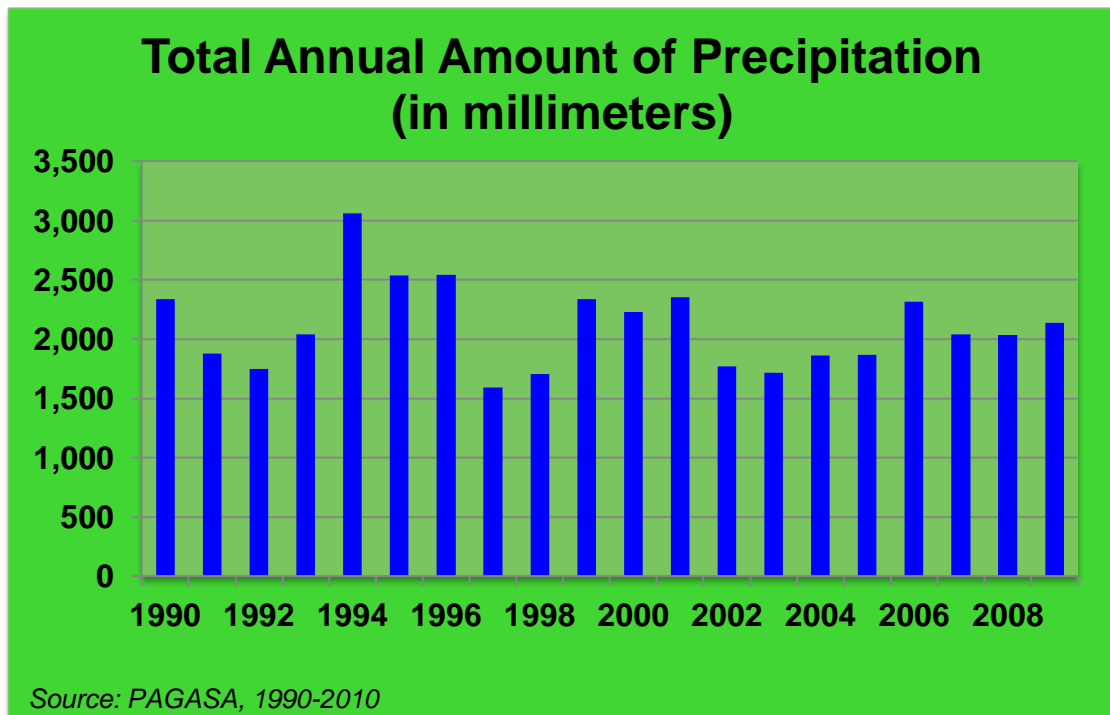


Figure 1. Total Annual Amount of Precipitation (in millimeters) in Iloilo City

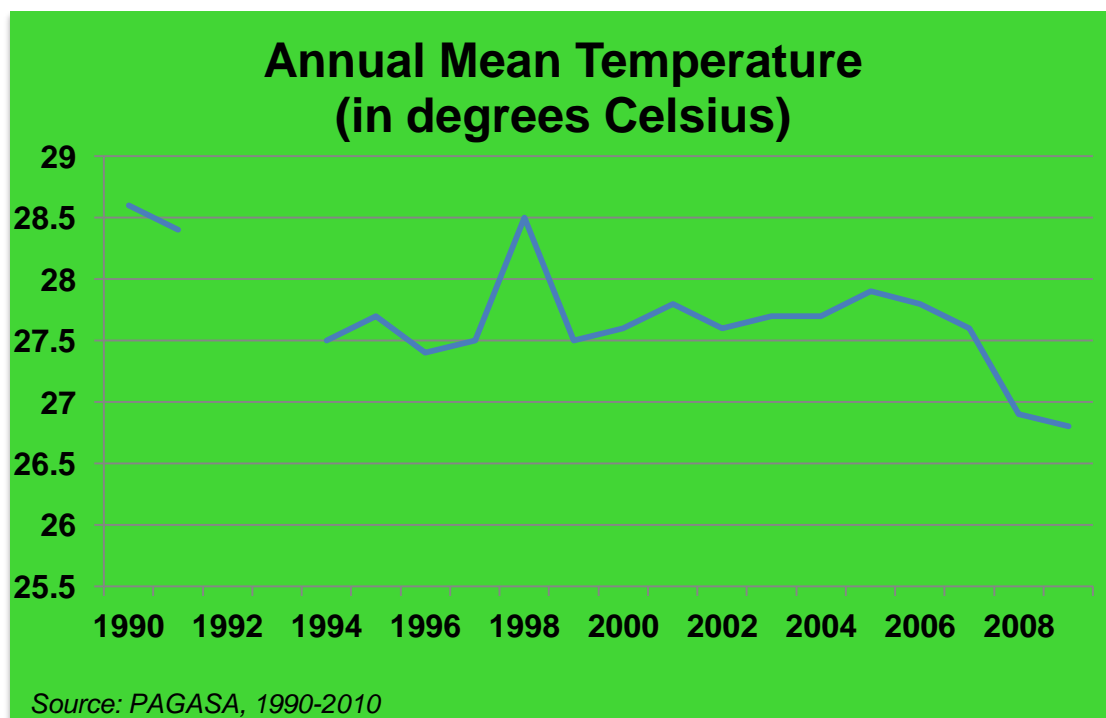


Figure 2. Annual Mean Temperature (in degrees Celsius) in Iloilo City

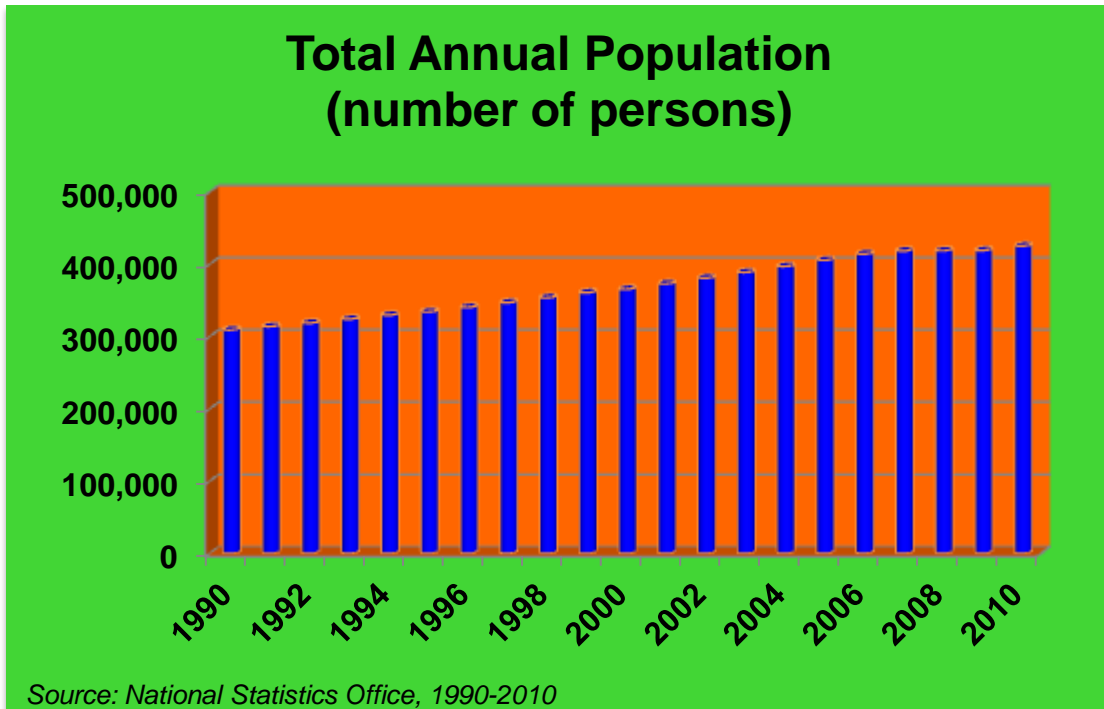


Figure 3. Total Annual Population (number of persons) in Iloilo City

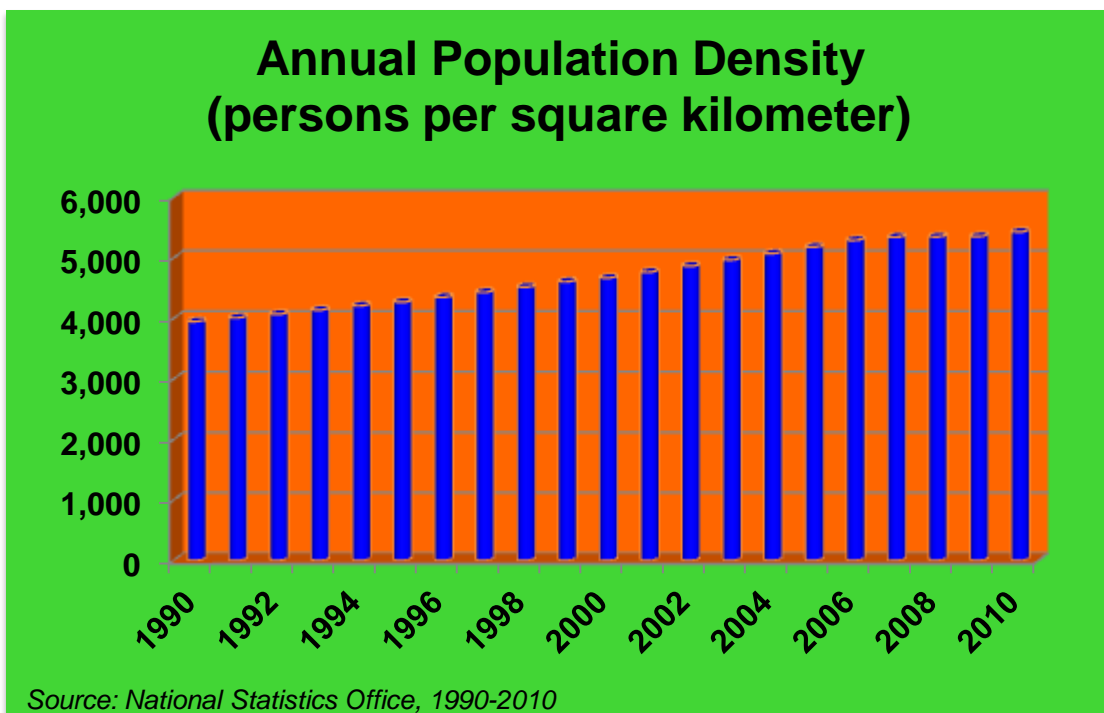


Figure 4. Annual Population Density (persons per square kilometer) in Iloilo City

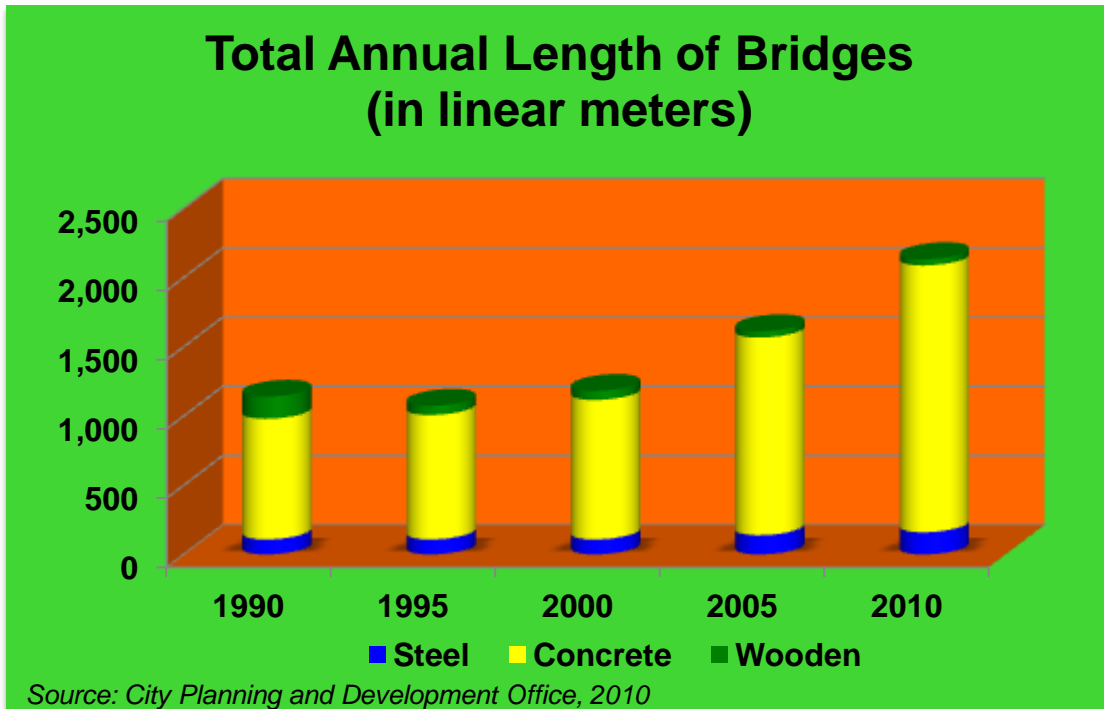


Figure 5. Total Annual Length of Bridges (in linear meters) in Iloilo City

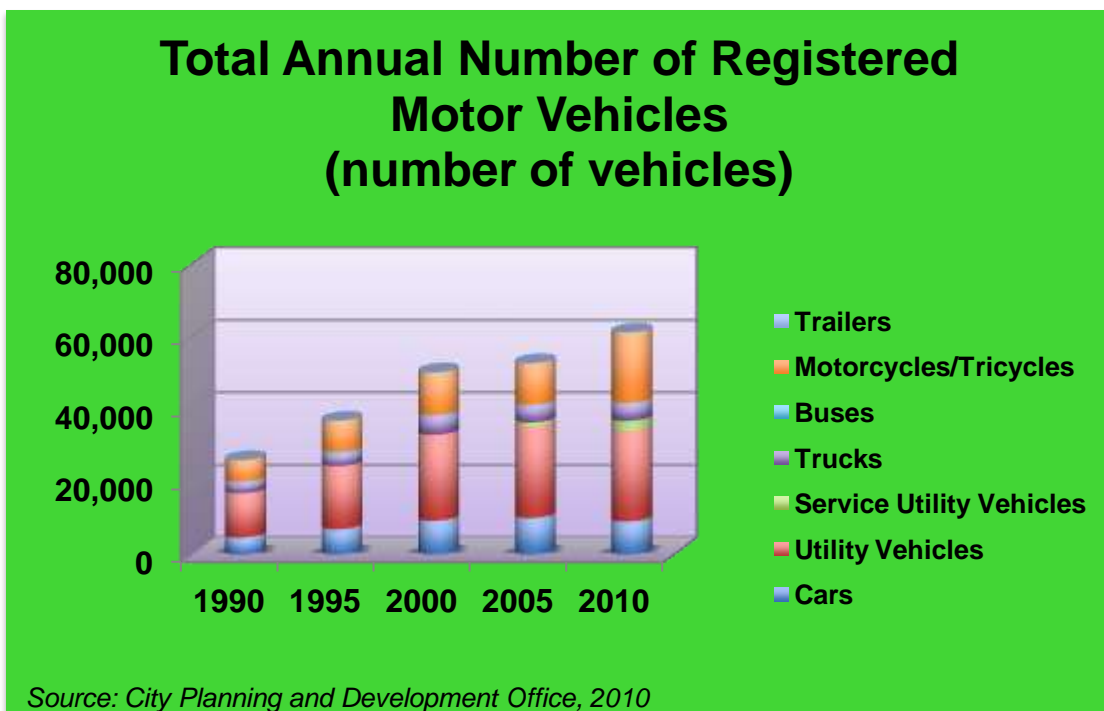


Figure 6. Total Annual Number of Registered Motor Vehicles (number of vehicles) in Iloilo City

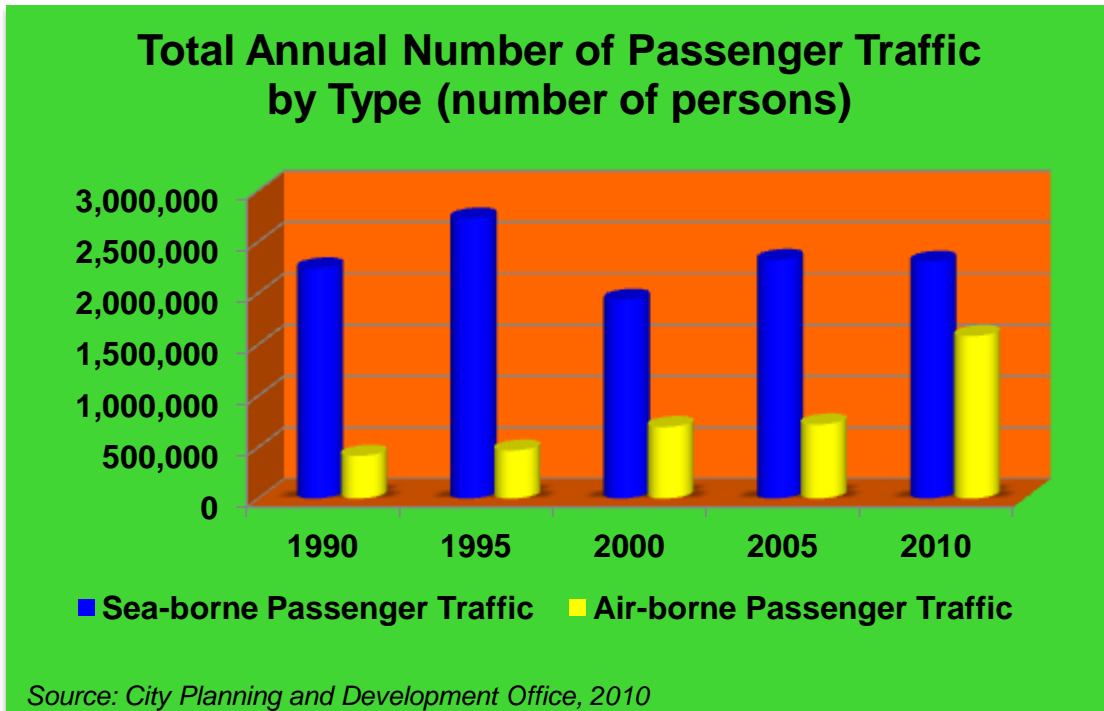


Figure 7. Total Annual Number of Passenger Traffic by Type (number of persons) in Iloilo City

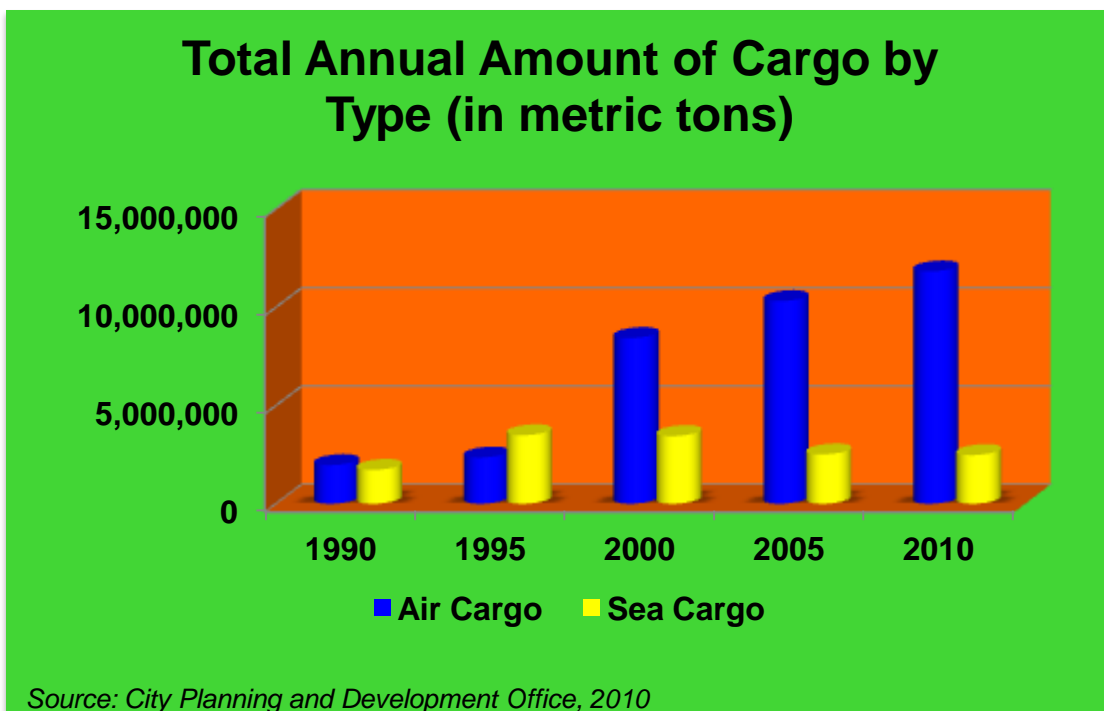


Figure 8. Total Annual Amount of Cargo by Type (in metric tons) in Iloilo City

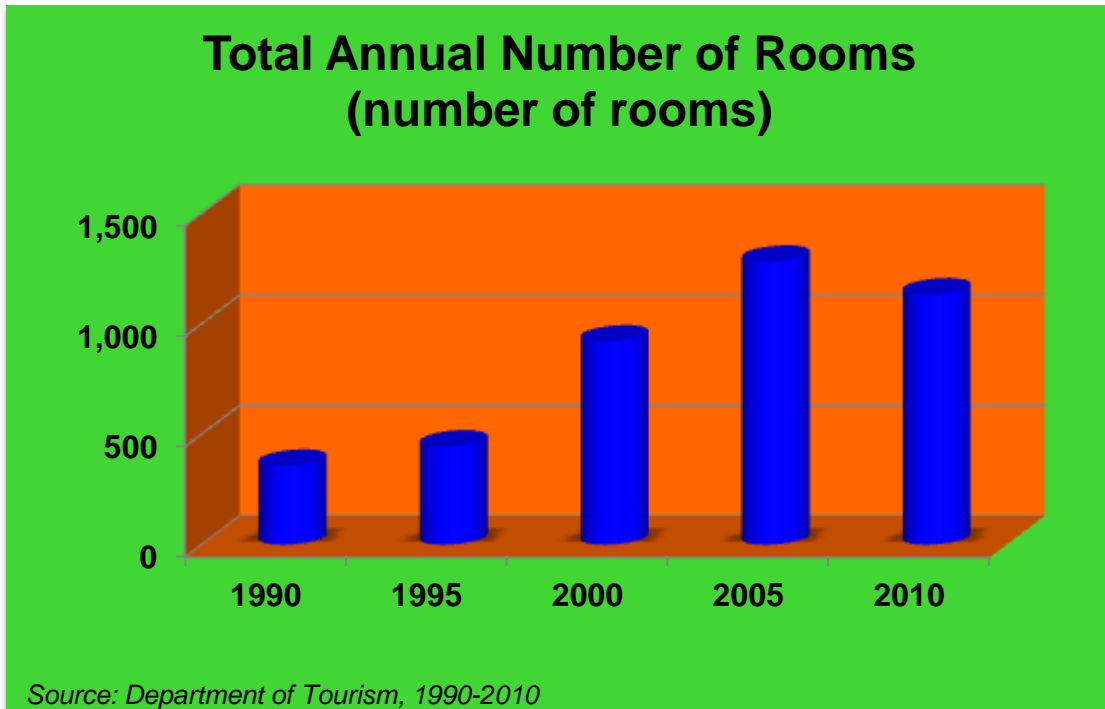


Figure 9. Total Annual number of Rooms (number of rooms) in Iloilo City

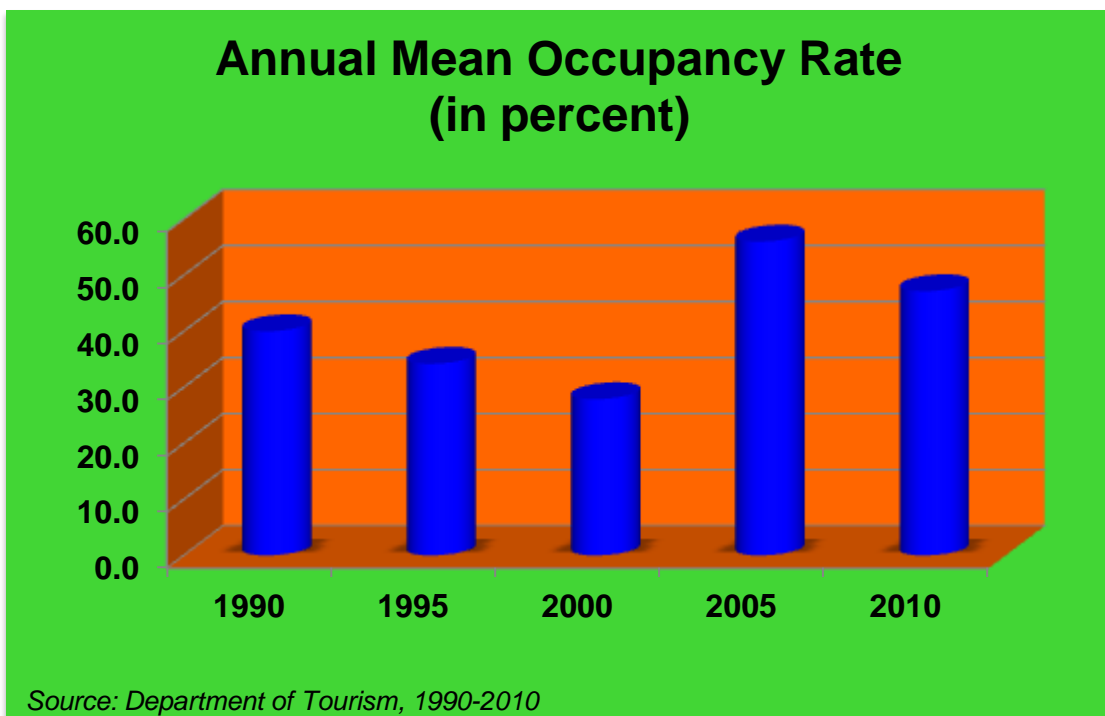


Figure 10. Annual Mean Occupancy Rate (in percent) in Iloilo City

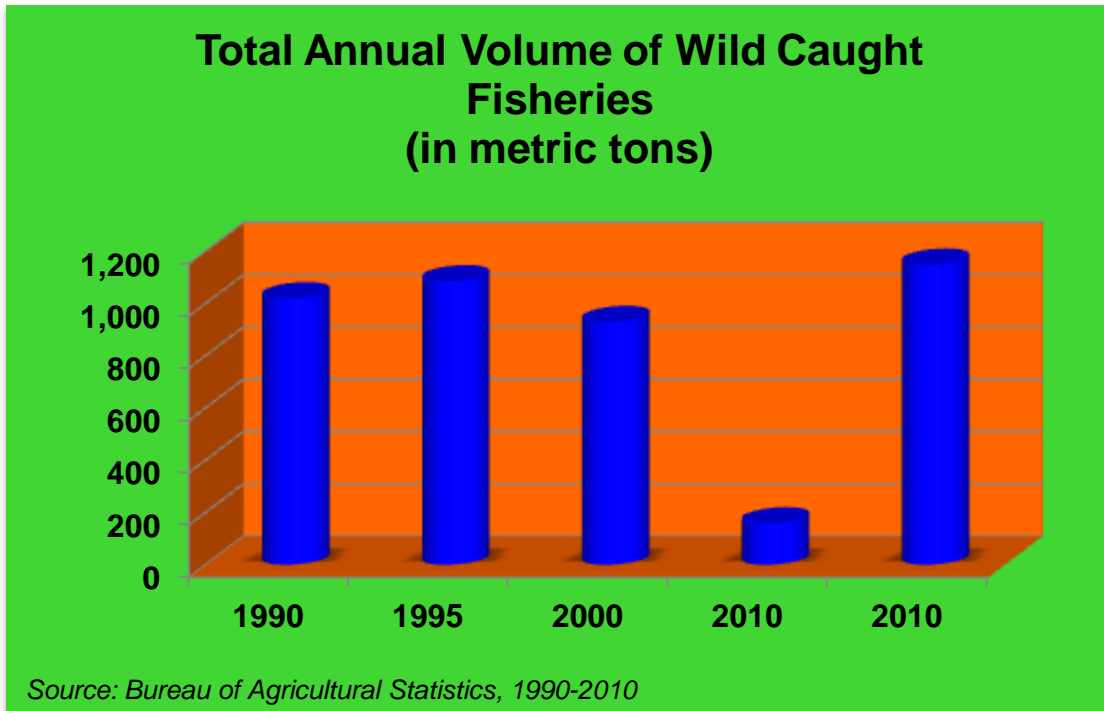


Figure 11. Total Annual Volume of Wild Caught Fisheries (in metric tons) in Iloilo City

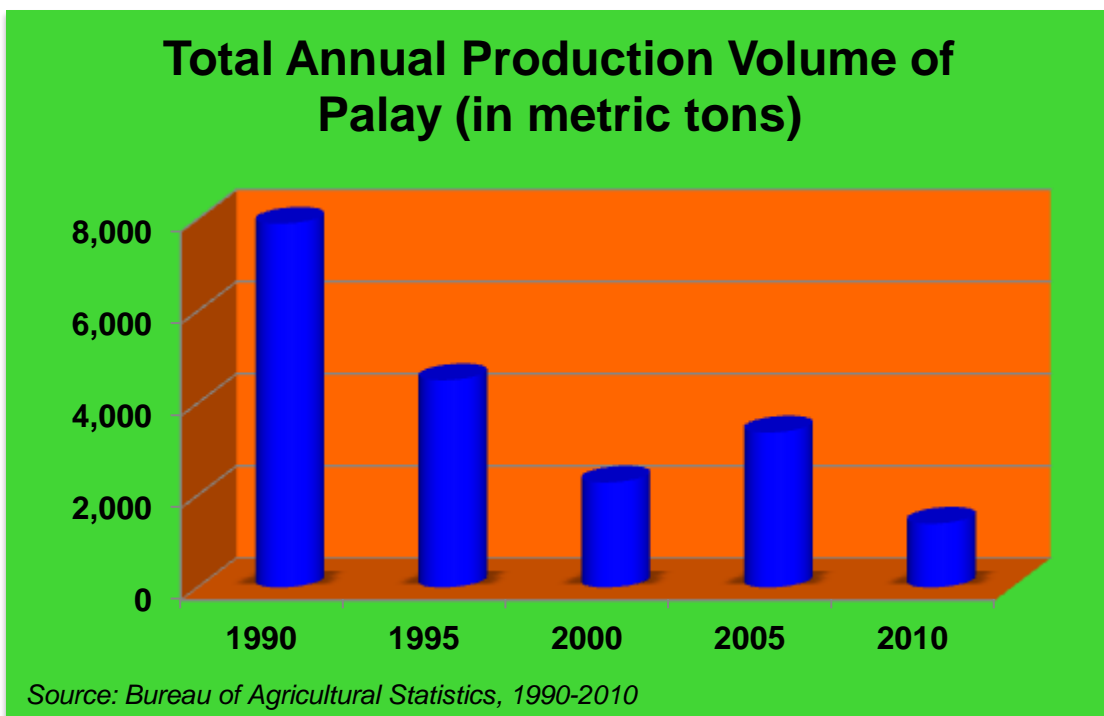


Figure 12. Total Annual Production Volume of Palay (in metric tons) in Iloilo City

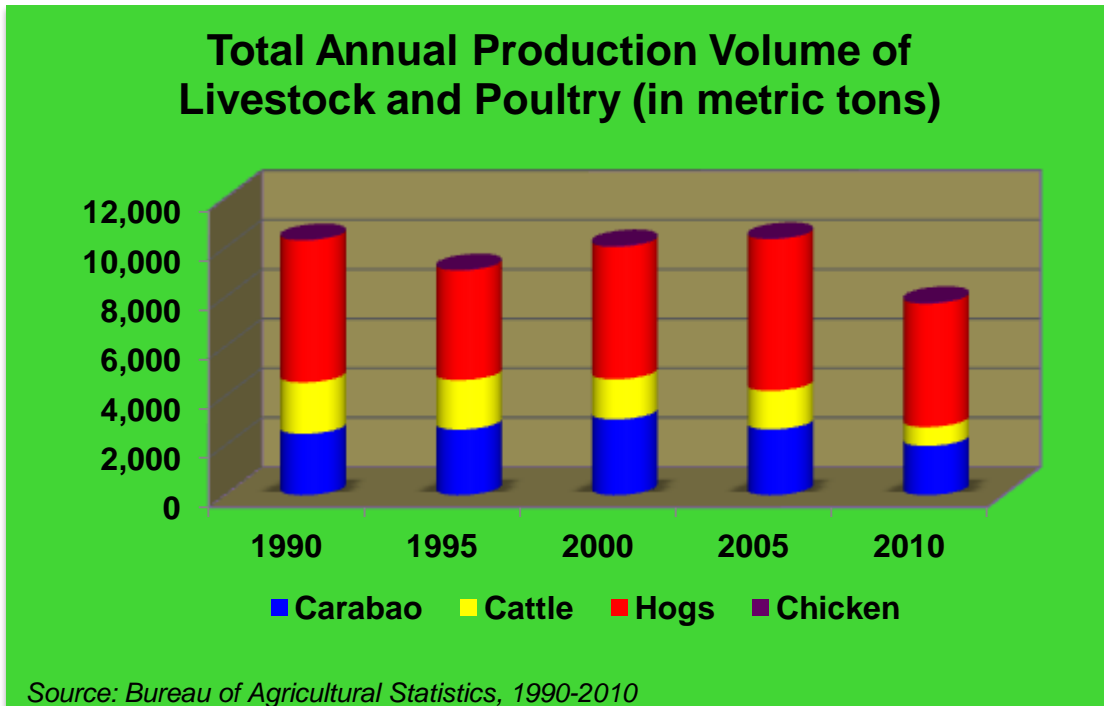


Figure 13. Total Annual Production Volume of Livestock and Poultry (in metric tons) in Iloilo City

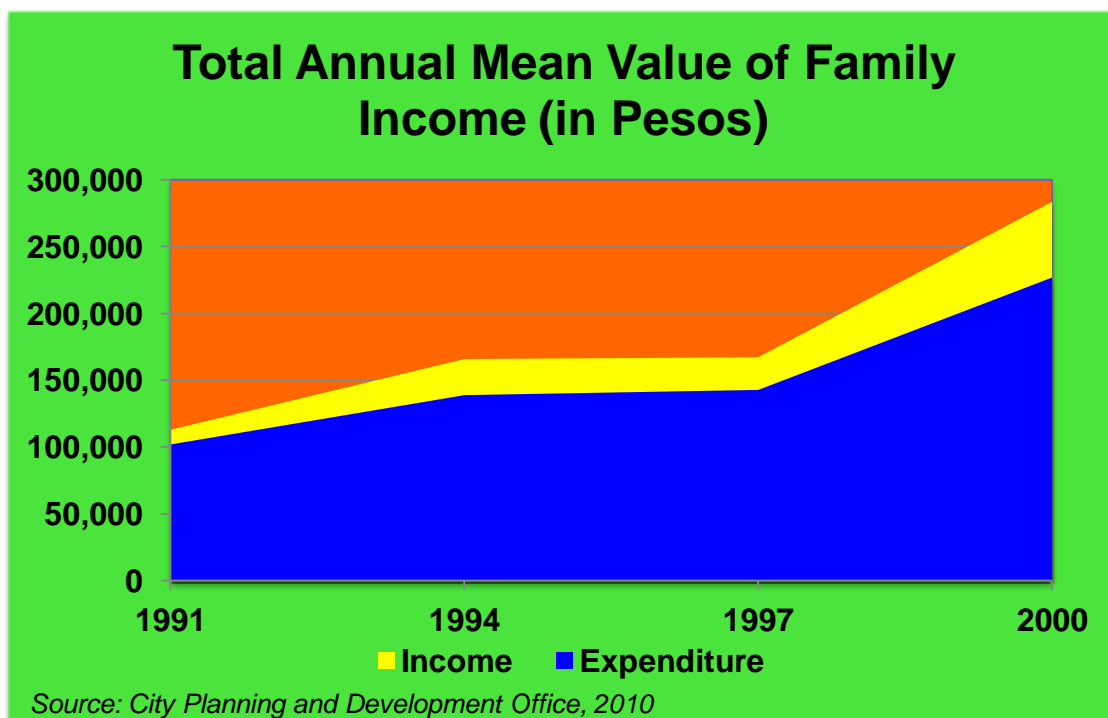


Figure 14. Total Annual Mean Value of Family Income (in Pesos) in Iloilo City

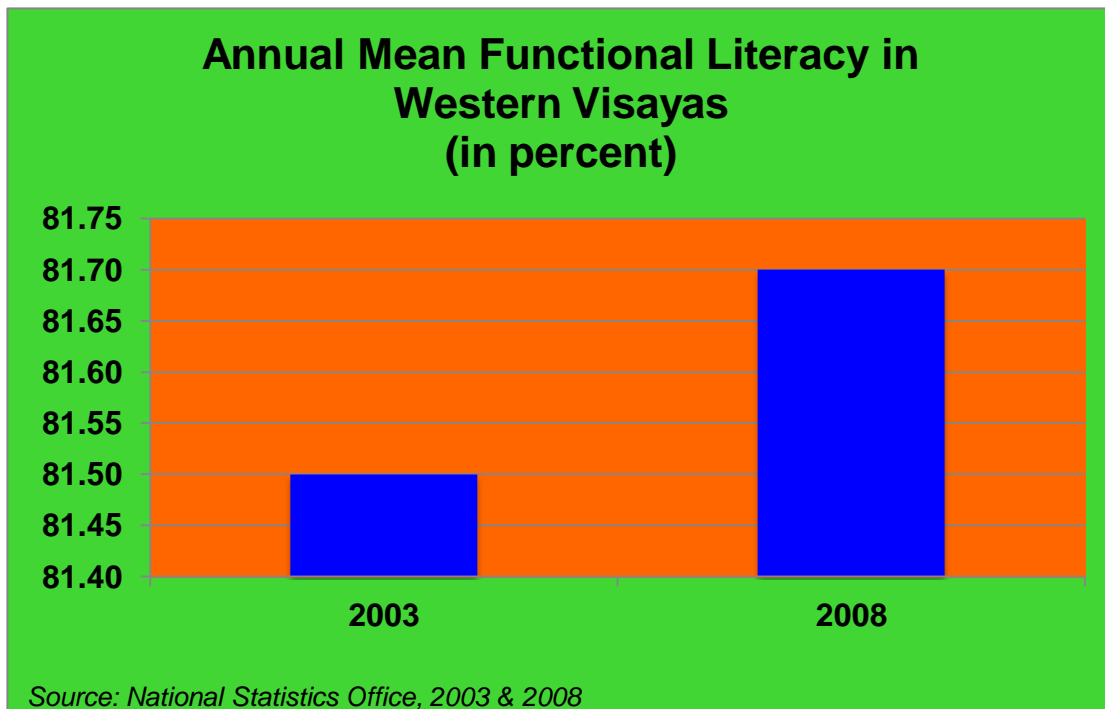


Figure 15. Annual Mean Functional Literacy in Western Visayas (in percent) in Iloilo City

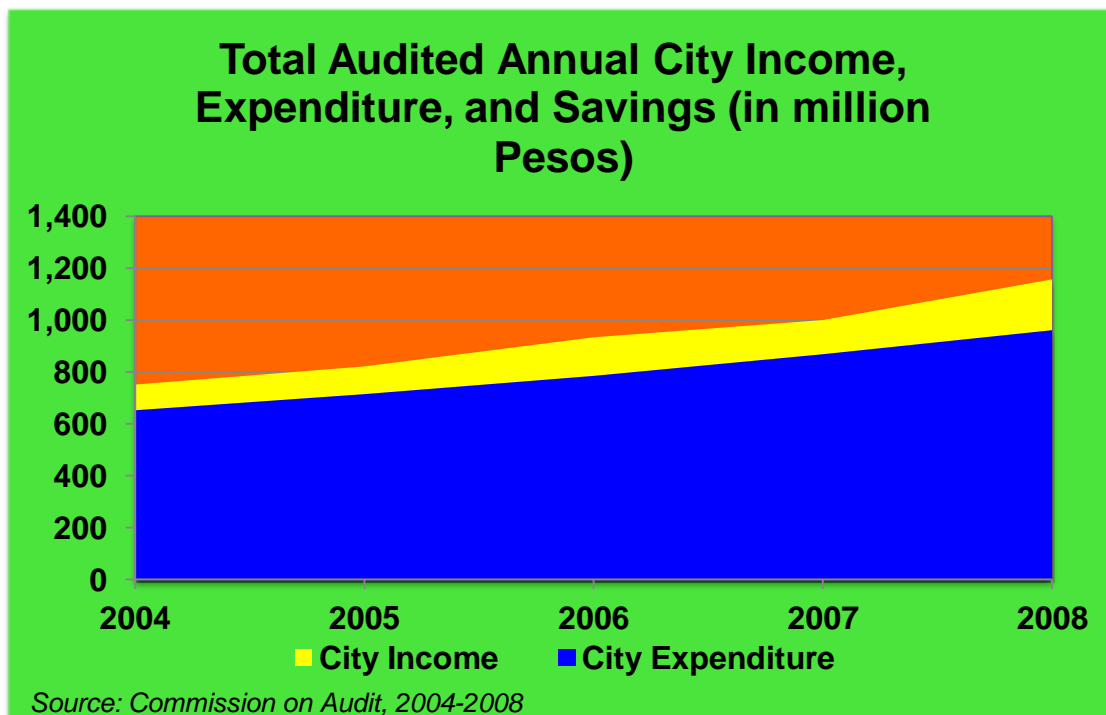


Figure 16. Total Audited Annual City Income, Expenditure, and Savings (in million Pesos) in Iloilo City

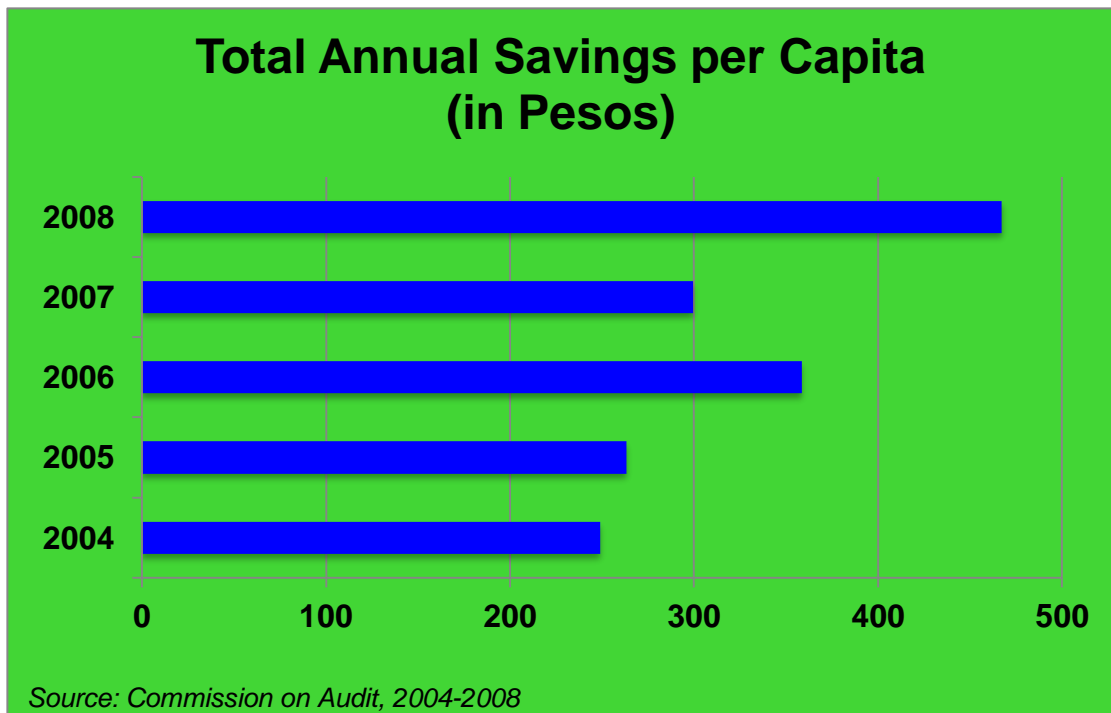


Figure 17. Total annual Savings per Capita (in Pesos) in Iloilo City

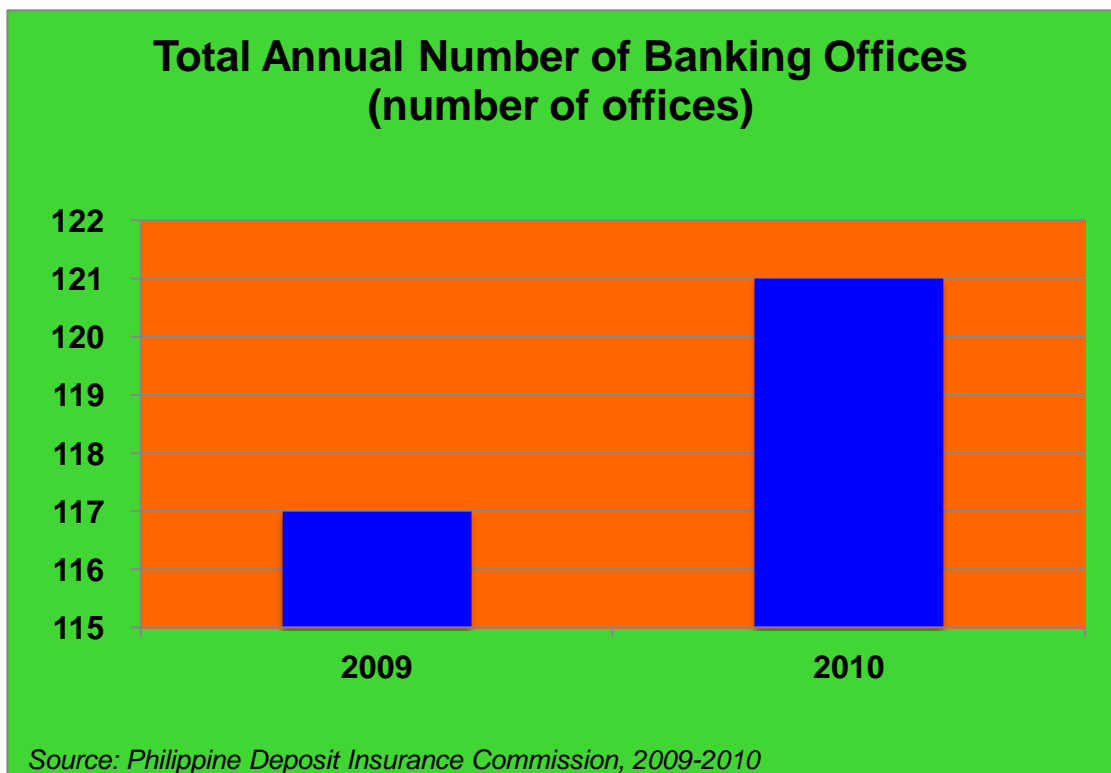


Figure 18. Total Annual Number of Banking Offices (number of offices) in Iloilo City

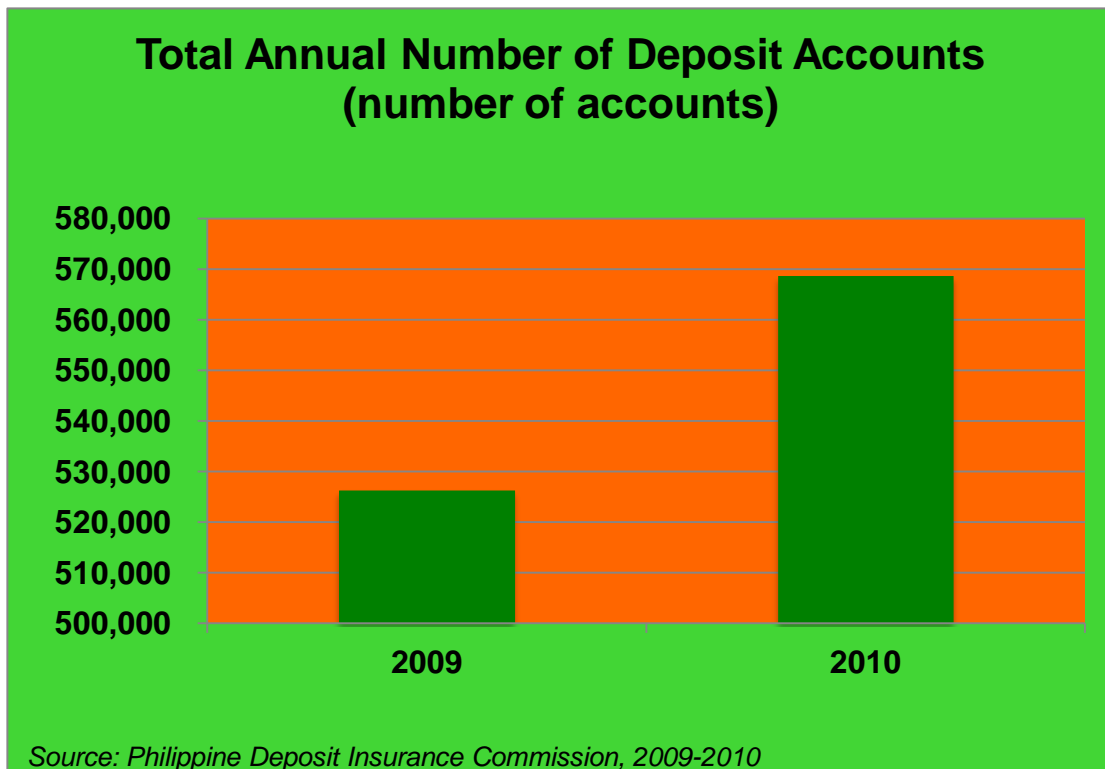


Figure 19. Total Annual Number of Deposit Accounts (number of accounts) in Iloilo City

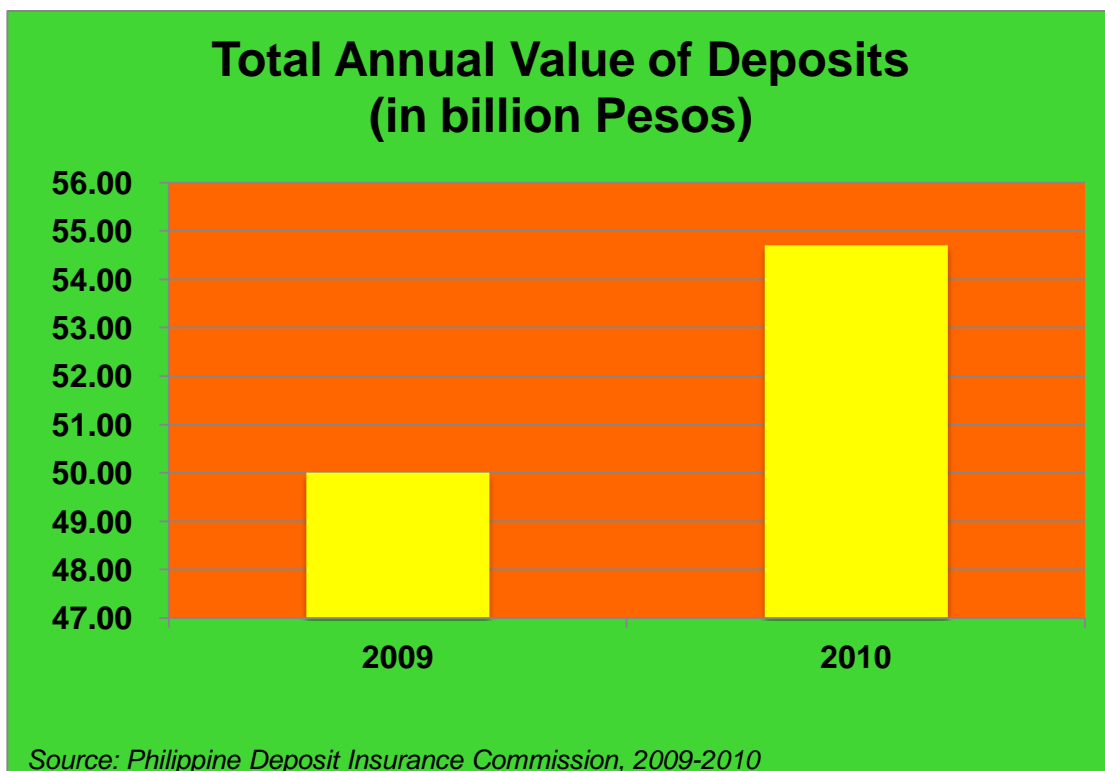


Figure 20. Total Annual Value of Deposits (in billion Pesos) in Iloilo City

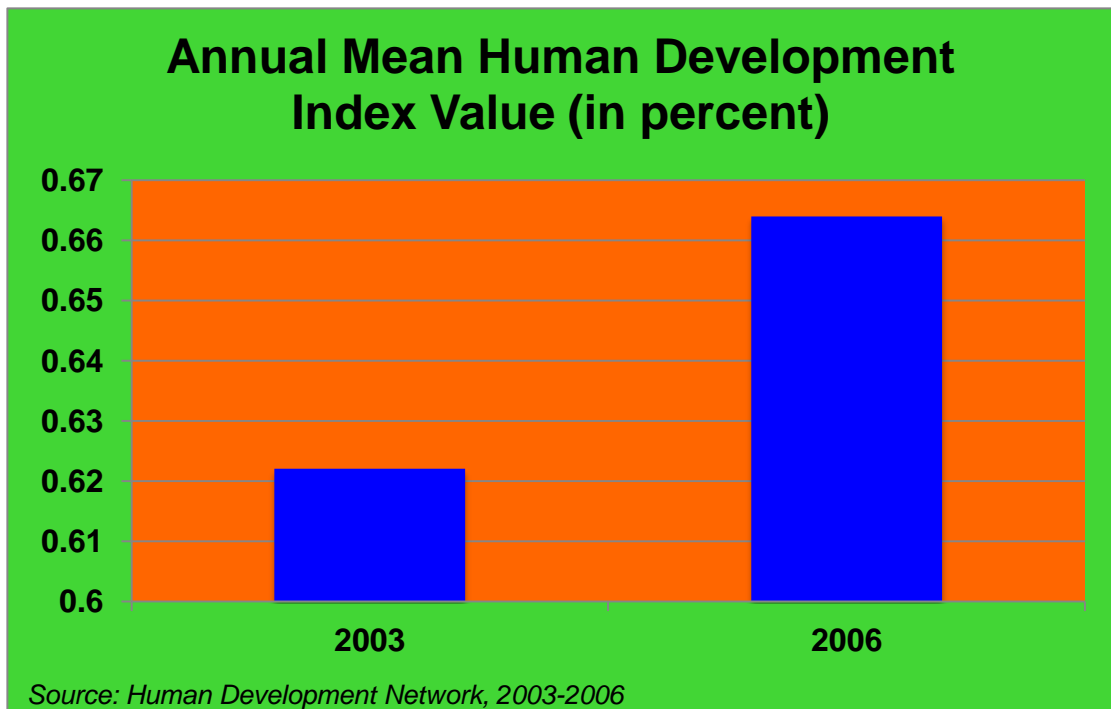


Figure 21. Annual Mean Human Development Index Value (in percent) in Iloilo City