Small Area Analysis of Phnom Penh Metropolitan Area

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Background

JICA Project on Improving Official Statistics in Cambodia Phase II has been being conducted for about three and half years from April 2007 to Sep. 2010.

Main Activities of JICA Project Phase II are as follows:
*1. Decennial **Population Census** in March 2008;*
*2. First-ever **Nation-wide Establishment Listing** in Feb. 2009.*

*First-ever **Economic Census** is planned to be conducted in March 2011 under the coming JICA Project Phase III.*

Basic Information on Analysis

1. Area Coverage

Phnom Penh and the surrounding 6 provinces are drawn on the maps:
Kandal, Takeo, Kampong Speu, Kampong Chhnang,
Kampong Cham and Prey Veng.

2. Concentric Circle

Pink circle are concentric circles which is taken Ou Ruessey III commune
as a center downtown of Phnom Penh.
The inner's circle's radius is 10km and the outer circle's one is 20km.

3. Source of data used on the maps

(1) 2008 Population Census
(2) 1998 Population Census
(3) 2009 Nation-wide Establishment Listing
(4) Commune boundary data (as of 7 Sep. 2009)

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Administrative Area in Cambodia

as of 7 Sep. 2009

- *Provinces (24) including 1 municipality*

- *Districts (193) including 8 khans and 26 cities*

- *Communes (1,621) including 204 sangkats*

- *Villages (14,073)*

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Outline of Phnom Penh

- *Population: 1.33 millions (10% of Cambodia)*

- *Area: 294km^2 (0.16% of Cambodia)*
  (376km^2 under GIS)

- *Population Density: 4,516 persons/km^2*
  (3,534 persons/km^2 under GIS)

- *Sex Ratio: 89 (females are 10% more than males.)*

- *Number of Establishment: 56,000 (15% of Cambodia)*

Population Density by Commune
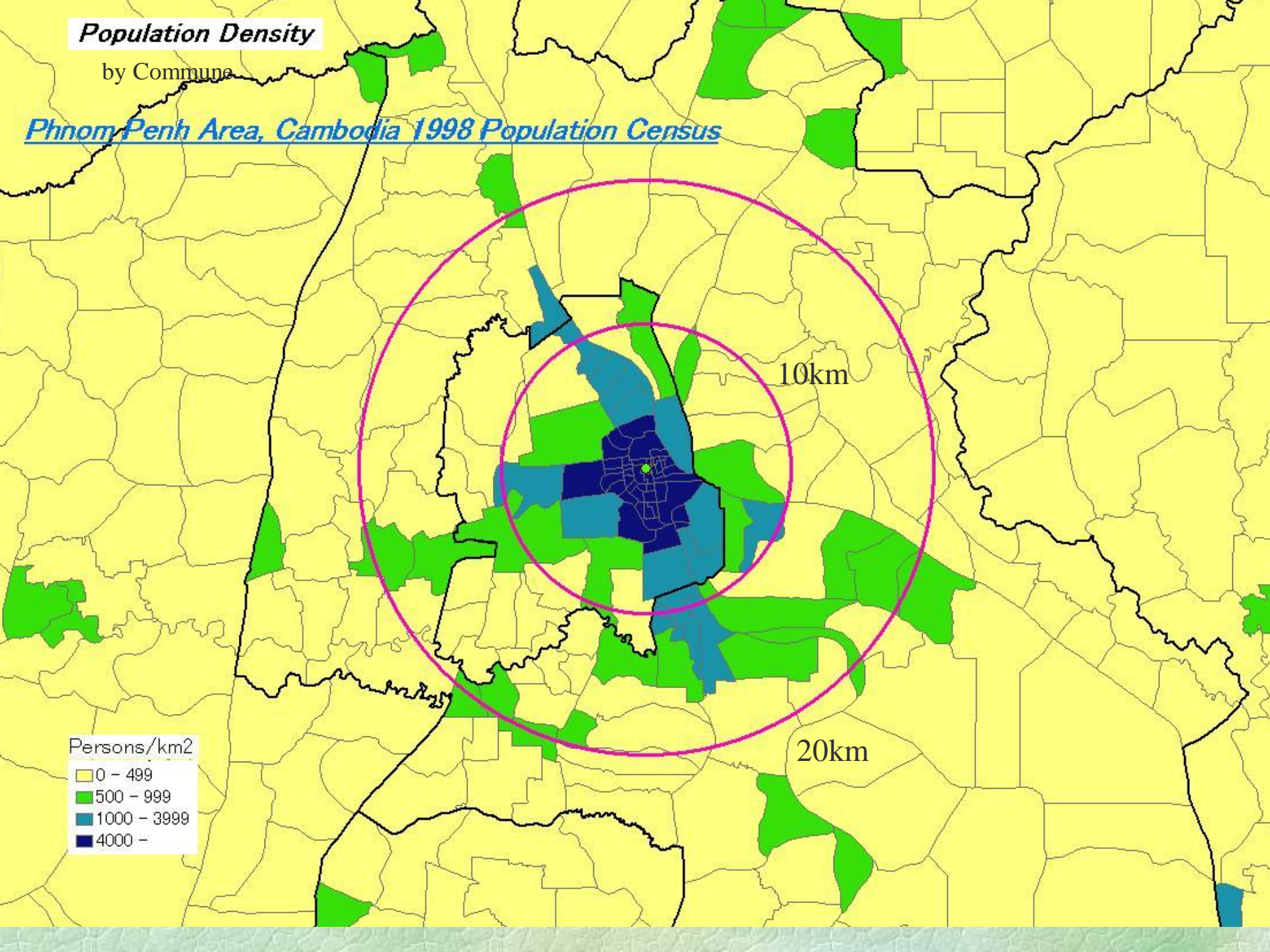
Phnom Penh Area, Cambodia 2008 Population Census

10km

20km
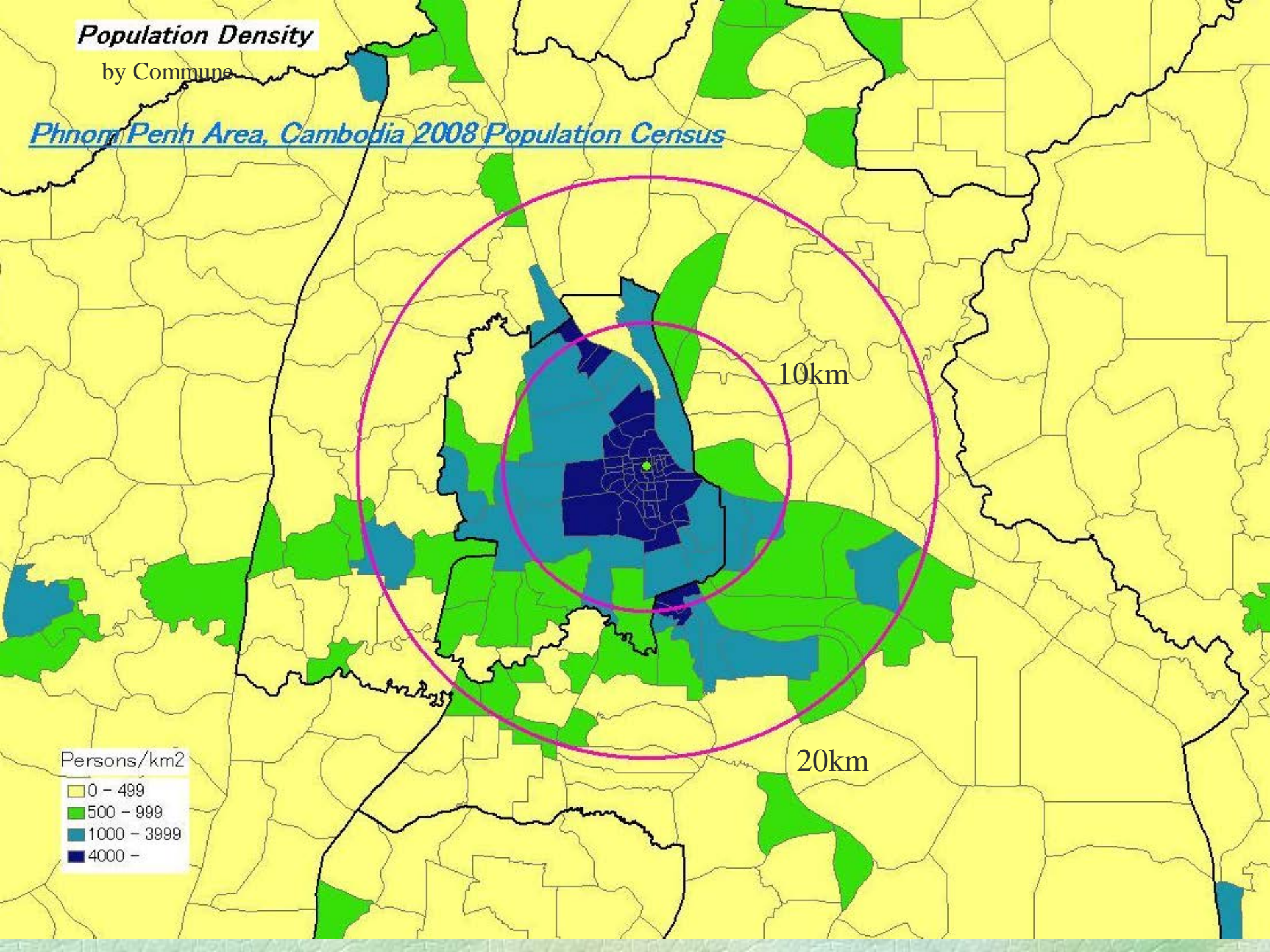
Persons/km2
0 – 499
500 – 999
1000 – 3999
4000 –

Population Density
by Commune

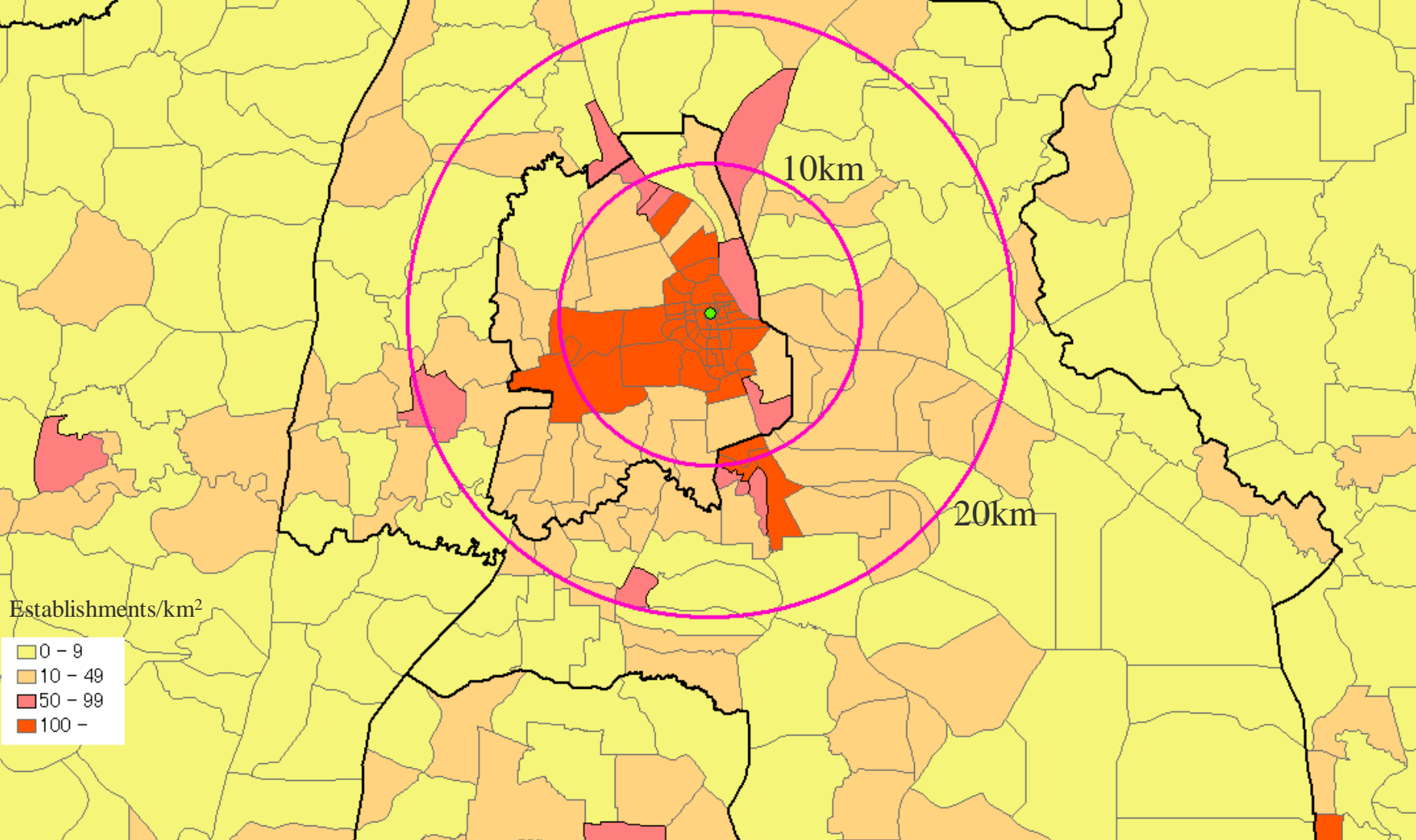*Phnom Penh Area, Cambodia 1998 Population Census*

10km

20km

Persons/km2
- 0 – 499
- 500 – 999
- 1000 – 3999
- 4000 –

Establishment Density
by Commune

Phnom Penh Area, 2009 Nation-wide Establishment Listing

10km

20km

Establishments/km²

☐	0 − 9
☐	10 − 49
☐	50 − 99
☐	100 −

Clark Model of Population Density

Population density in urban area declines exponentially as away from the down town, Clark Model advocated by a British Dr. Colin G. Clark in 1951.

This has already been proved in many cities all over the world.

Allocation of Clark Model
to Phnom Penh Metropolitan Area

- *Center of the concentric circle:*

  the most inhabited commune in PP

- *Population by range of distance from the center:*

  Assigned each commune to each range of distance by barycentric coordinates of each commune.

- *Distance from the center*

  Calculated by two coordinates of both the center and the barycenter of each commune.

Graph 1-1. Population Density by Distance from the Most Inhabited Commune in Phnom Penh (2008)
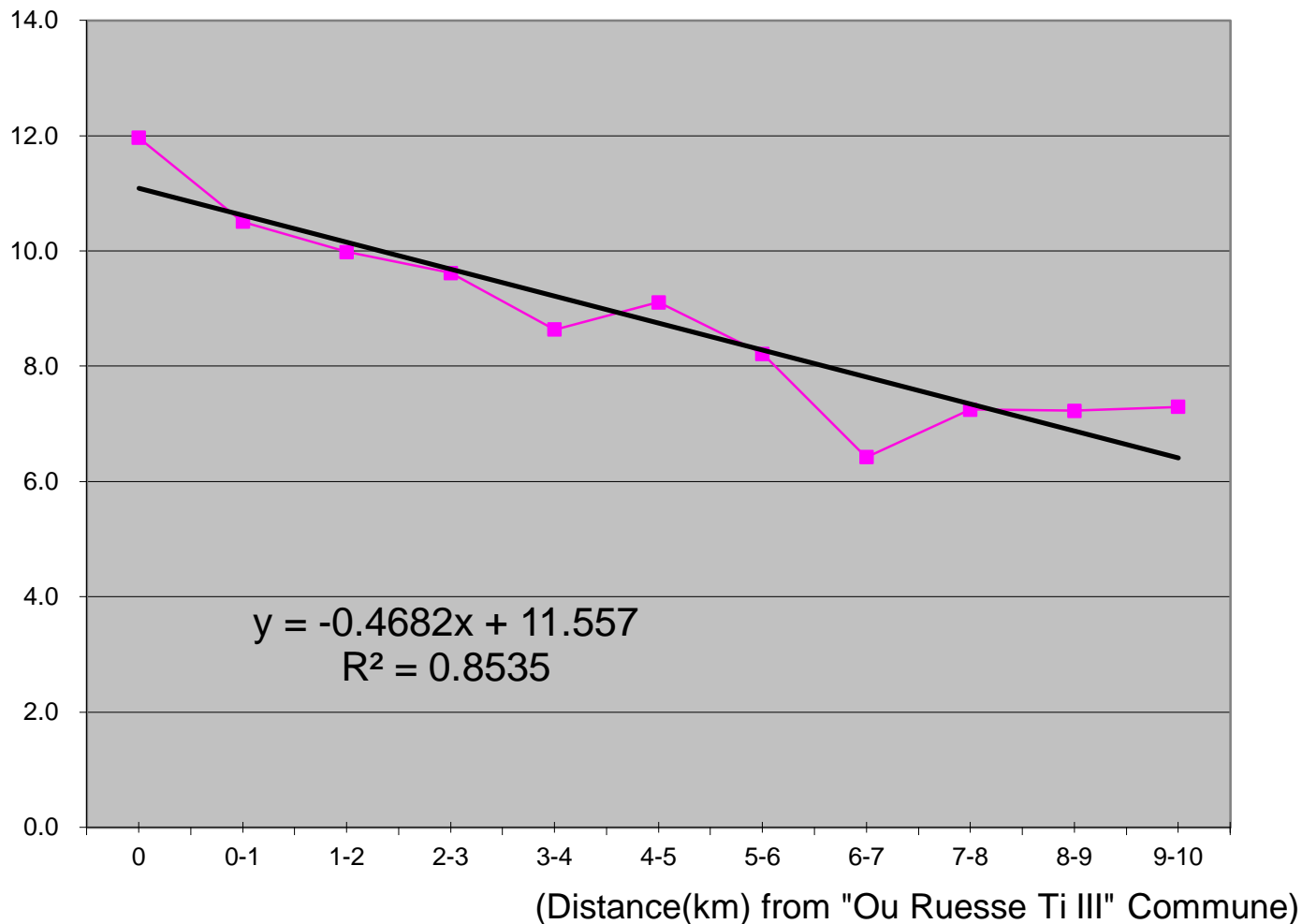
(persons/km^2)
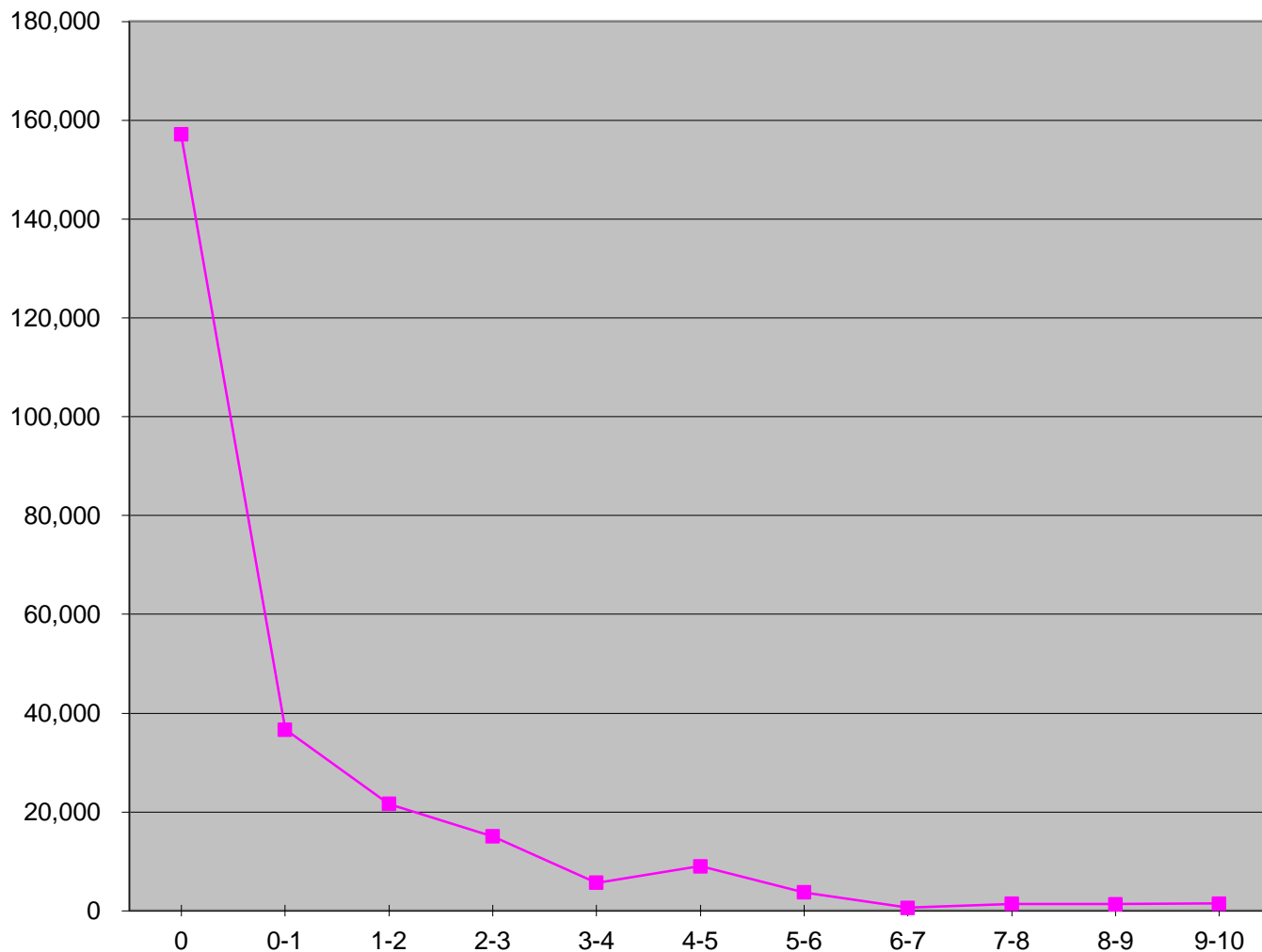
(Distance(km) from "Ou Ruesse Ti III" Commune)

Source: 2008 Population Census of Cambodia,
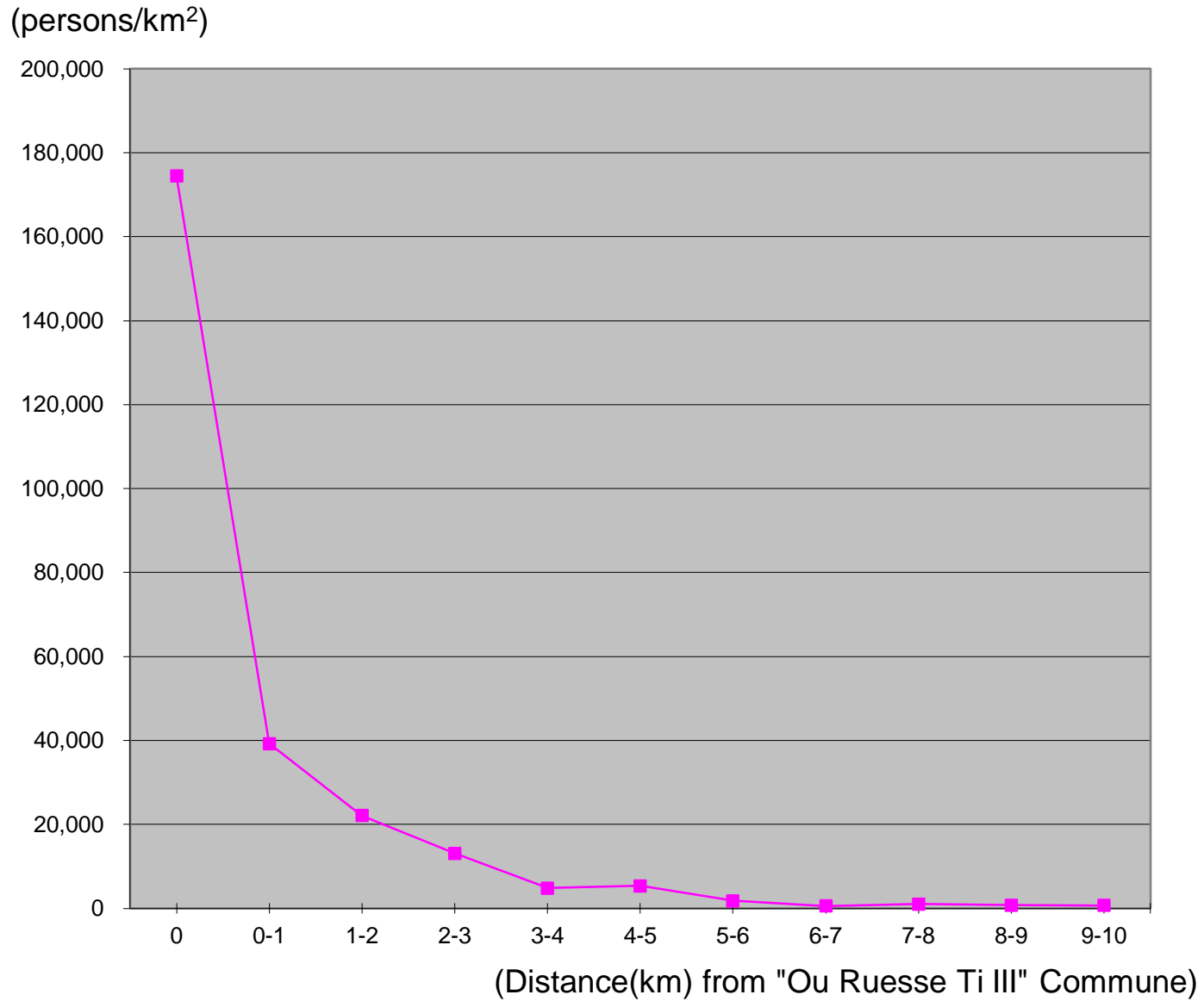*F. Nishi , Japan*

Graph 1-2. Application of Clark Model to Population Density by Distance from the Most Inhabited Commune in Phnom Penh (2008)

(LOG of Density)

$y = -0.4682x + 11.557$
$R^2 = 0.8535$

(Distance(km) from "Ou Ruesse Ti III" Commune)

*Source: 2008 Population Census of Cambodia,
F. Nishi, Japan*

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Graph 2-1. Population Density by Distance from the Most Inhabited Commune in Phnom Penh (1998)

(persons/km^2)

(Distance(km) from "Ou Ruesse Ti III" Commune)

Source: 1998 Population Census of Cambodia,
F. Nishi , Japan

Graph 2-2. Application of Clark Model to Population Density by Distance from the Most Inhabited Commune in Phnom Penh (1998)
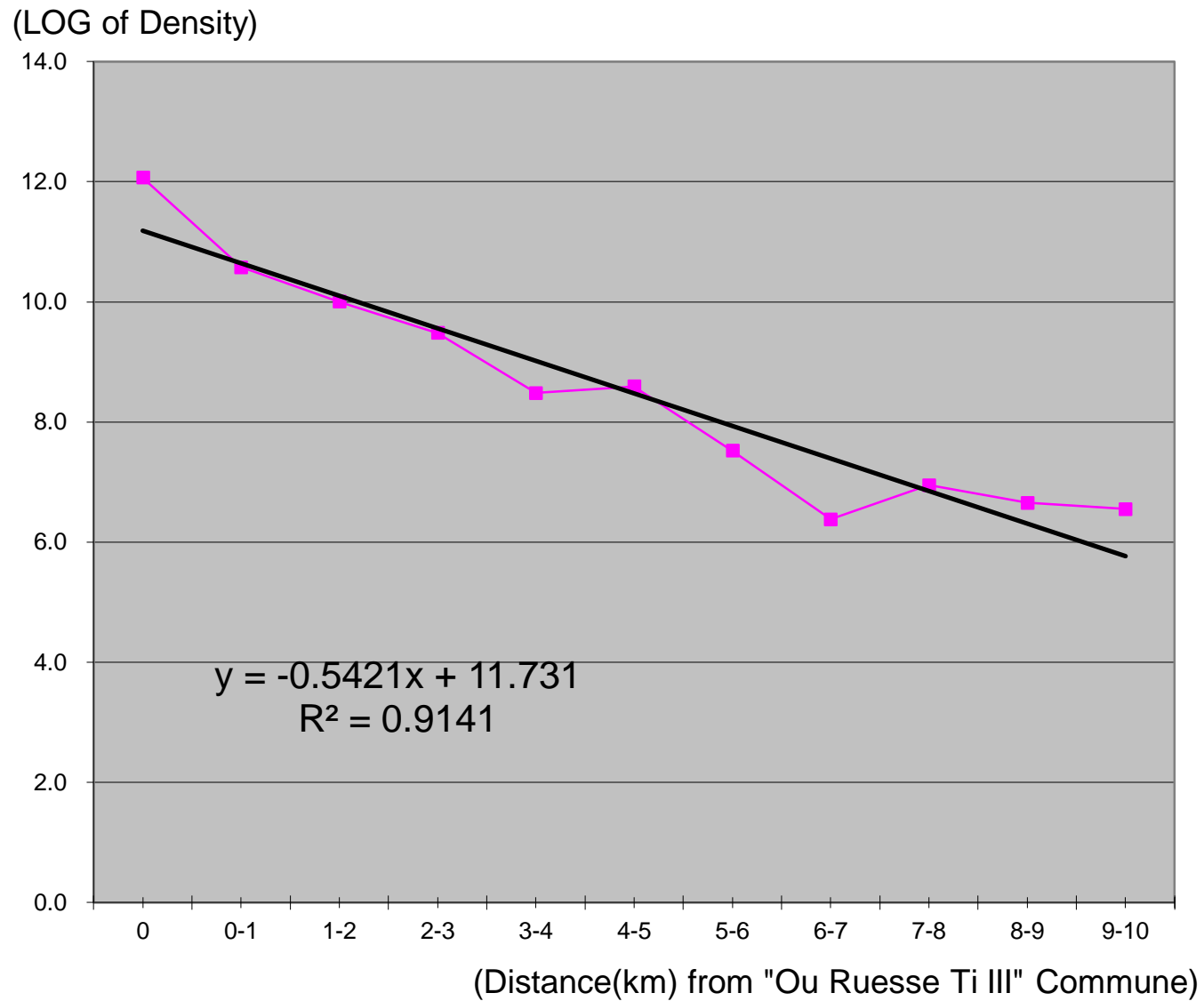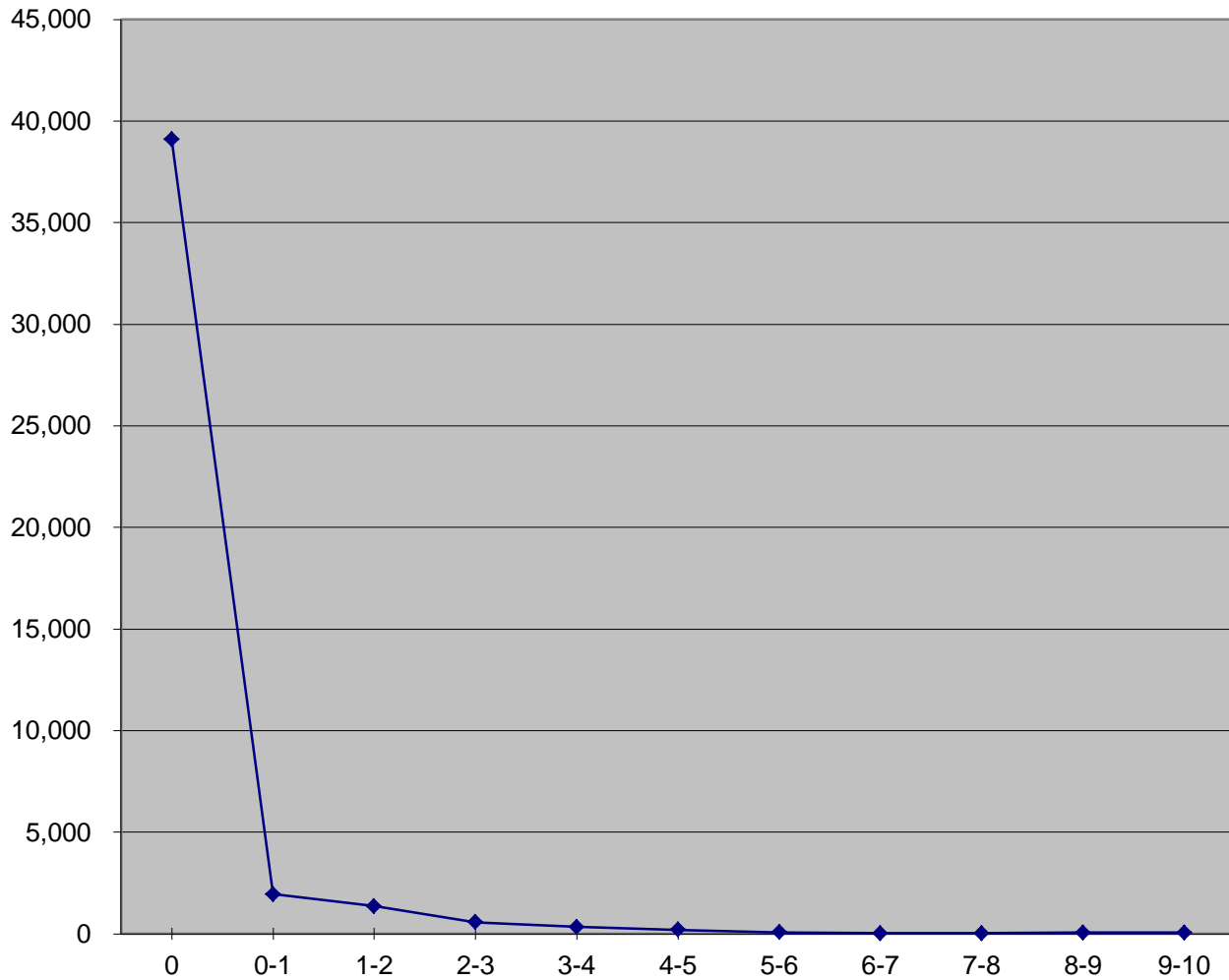
(LOG of Density)

$y = -0.5421x + 11.731$
$R^2 = 0.9141$

(Distance(km) from "Ou Ruesse Ti III" Commune)

Source: 1998 Population Census of Cambodia,
F. Nishi, Japan

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Graph 3-1. Establishment Density by Distance from the Most Dense Commune in Phnom Penh (2009)

(establishments/km^2)

(Distance(km) from "Ou Ruesse Ti I" Commune)

Source: 2009 Nation-wide Establishment Listing of Cambodia,
F. Nishi , Japan

**Graph 3-2.   Application of Clark Model
          to Establishment Density by Distance
          from the Most Dense Commune in Phnom Penh (2009)**

(LOG of Density)

$y = -0.587x + 9.2016$
$R^2 = 0.8047$

(Distance(km) from "Ou Ruesse Ti I" Commune)

*Source: 2009 Nation-wide Establishment Listing of Cambodia,
          F. Nishi , Japan*

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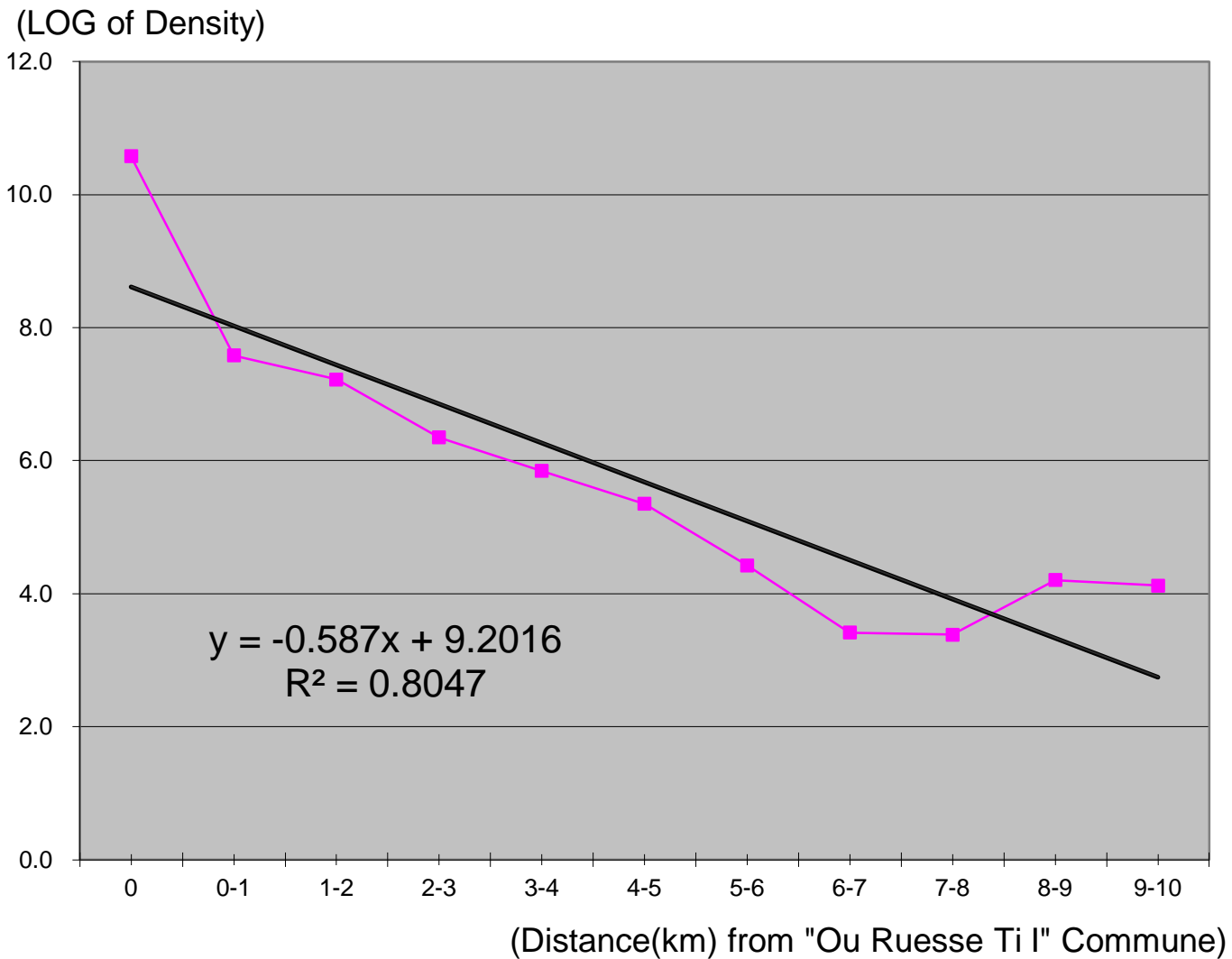
Results of Allocation of Clark Model
to Phnom Penh Metropolitan Area

- *Regarding population density in 2008, Graph 1-2 shows that the distribution of the logarithm of the population density by range of distance is rectilinear because R^2 is 0.85. It means that the distribution of the population density by range of distance on Graph 1-1 is exponentially. Therefore, it has been confirmed that Clark Model is allocated in PP as well. Also 1998 has been proved as Graph 2-1 and 2-2.*

- *It has been confirmed that Phnom Penh Metropolitan Area is extending. Because the slope of regression equation on Graph 1-2 and 2-2 which is one of indicators showing the level of development of a city is becoming more even.*

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- *Regarding establishment density in 2009, Graph 3-2 shows $R^2=0.80$. It means that the allocation to Clark Model of establishment is worse than that of population.*

  However, government offices, mobile establishments, and so on are not included in the above mentioned establishment.

THE END

http://www.stat.go.jp/english/info/meetings/cambodia/phase2.htm