APPENDIX B

FORMULATION OF BANDA ACEH METROPOLITAN DEVELOPMENT CONCEPT

CHAPTER 1 METROPOLITAN CITY APPROACH

1.1 INTRODUCTION

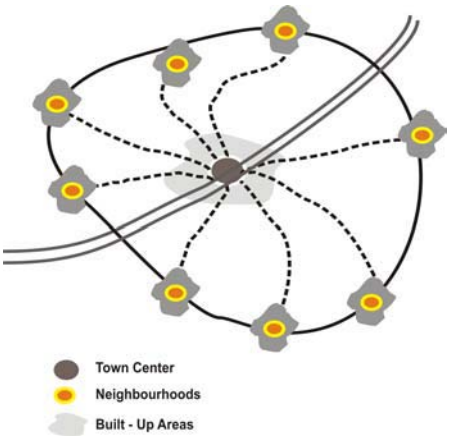
– **Classification of Metropolitan is as follows:** [1]

Land use management is directed to create a **harmony of regional and urban centers**, both administratively and functionally, and the nature of the plan **involves strategic matters.**

– **Based on population number:**

The population of Metropolitan urban area is between **1,000,000 to 5,000,000 people**.

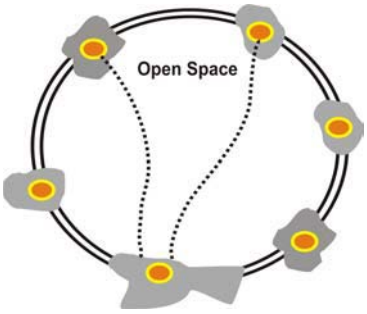
1.2 "SATELLITE AND NEIGHBOURHOOD PLANS" URBAN MODEL APPROACH



Based on this approach, **the principal city and the surrounding small cities** ("Satellite" cities) will be linked in such a way that *functional attachment becomes more effective* and *efficient*. Therefore transportation, communication infrastructure and utilities between the big city with satellite cities and between satellite cities must be upgraded accordingly. The development of satellite cities can function to absorb the huge flow of urbanites to the principal city, by improving the functions of satellite cities in order to increase its **"Working Opportunities"**. In this case **"concentric development"** will dominate urban area development both in **"Main Urban Center"** as well as in its satellite cities. Satellite city is a small city located near a big city where its urban life is very much determined by the large city, in economic terms.

1.3 "CIRCUIT LINEAR OR RING PLAN" URBAN MODEL APPROACH

In this approach, the model consists of several urban centers growing along a circular main road. The central area is conserved as green area/open space. Each center may grow into a big city.



A transportation system is built traversing the central area as a shortcut road. Each center will grow steadily if they possess their own unique specific functions, promoting a strong and exuberant growth of functional linkages between centers.

[1] Based on Undang-Undang No. 22 Tahun 1999 regarding Local Governance

CHAPTER 2 POPULATION CITY SIZE IDENTIFICATION

2.1 PROJECTED POPULATION

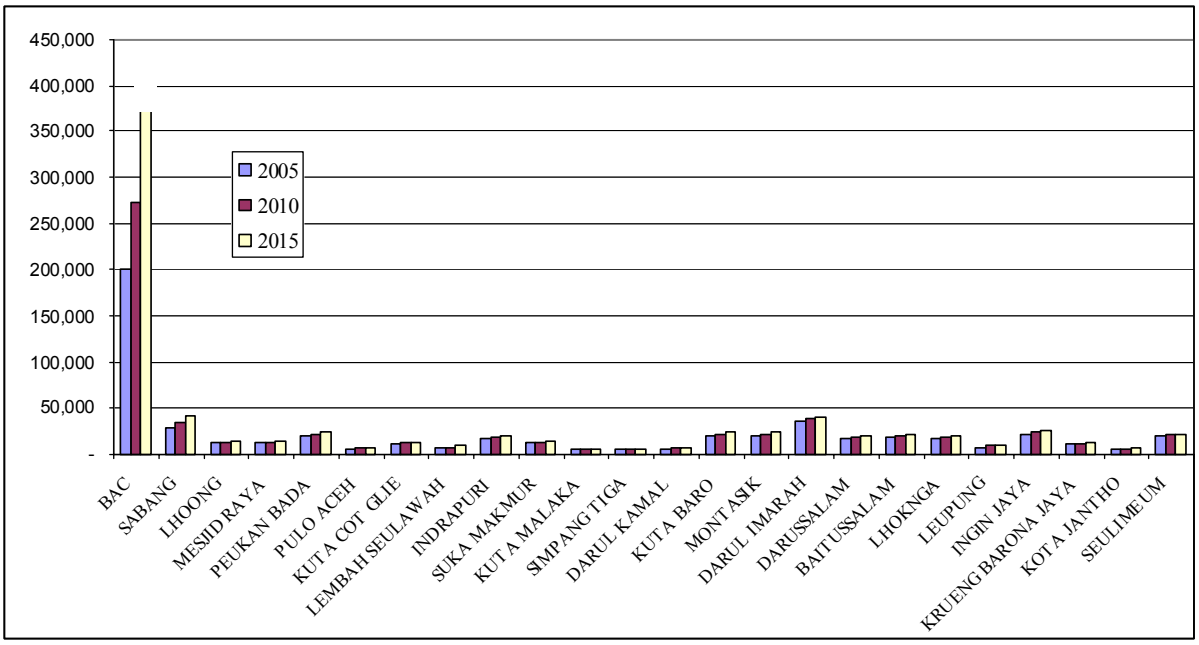
The projected BAC population based on population growth in URRP Study for target year 2009 will be extrapolated until target year 2015. Population growth in Sabang City and Aceh Besar Regency is calculated based on normal population growth by each district/city. Therefore total population for target year 2015 for 1) BAC: 409,143 people (51%); 2) Sabang: 41,227 people (5%); 3) Aceh Besar Regency: 355,267 people (51%). Further details can be seen in the following table.

Table 2.1.1 Projected Population of BAC, Sabang and Aceh Besar, Target Year 2015

No.	City/District	PROJECTED POPULATION		
		2003	2009	2015
1	BAC	235,523	254,000	360,304
2	Sabang	26,505	33,325	41,900
3	Lhoong	11,592	12,578	13,648
4	Krueng Raya	12,277	13,321	14,455
5	Peukan Bada	19,457	21,112	22,908
6	Lampuyang	6,002	6,524	7,091
7	Lampu'uk	10,756	11,705	12,664
8	Lamtamot	7,184	7,705	8,458
9	Indrapuri	16,658	18,075	19,693
10	Sibreh	12,137	13,169	14,290
11	Samahani	4,768	5,174	5,614
12	Krueng Mak	5,009	5,435	5,897
13	Peukan Bilui	5,932	6,448	7,009
14	Peukn Ateuk	20,107	21,817	23,673
15	Montasik	19,997	21,698	23,554
16	Lampeuneuret	34,420	37,490	40,751
17	Lambaro Angan	16,355	17,746	19,256
18	Lambada Lhok	18,177	19,723	21,401
19	Lhoknga	16,556	17,984	19,473
20	Leupung	7,878	8,548	9,275
21	Lambaro	21,466	23,292	25,273
22	Cot Iri	10,338	11,217	12,172
23	Kota Jantho	5,736	6,224	6,753
24	Seulimeum	18,944	20,556	22,304
	Total ABR	301,746	327,997	356,531
	Total	**539,774**	**695,415**	**758,735**

Source: JICA Study Team, 2005 and Additional Study Team, 2006

Figure 2.1.1 Projected Population of BAC, Sabang and Aceh Besar, Target Year 2005, 2010, 2015



Source: Additional Study Team, 2006

2.2. CITY SIZE IDENTIFICATION

One approach for the determination of "City Size" is based on population number, classified into the following:

- **Megapolitan City**, if an urban area has a population of more than 5,000,000; Metropolitan City, if the urban area has a population between 1,000,000 to 5,000,000;
- **Metro City**, where land utilization control is directed towards a harmonious regional/urban center, from the point of view of an administrative as well as functional harmony, and the nature of the plan relates to strategic matters. Metropolitan urban area has a population between 1,000,000 to 5,000,000;
- **Big City**, if the urban area has a population between 500,000 to 1,000,000;
- **Medium City**, if the urban area has a population between 100,000 to 500,000;
- **Small City**, if the urban area has a population between 50,000 to 100,000 (Java Island), or 20,000 to 100,000 (outside Java Island).
- Population in rural area may be less than **small city** population, covering wider area with low population density. Rural classification may be based on its geographic location, such as coastal village, lowland village and mountainous village. Other classification may be based on its potentials, such as self-help village (*desa swadaya*), self-sufficient village (*desa swasembada*) and self-motivated village (*desa swakarsa*). Based on its function a village may be an agropolitan or growth center villages.

Based on the above definition and classification of regional/urban center, in the study area there is one medium city, which is BAC, eight small cities: Sabang, Darulimarah, Ingin jaya, Kuto baru, Montasik, Peukan bada, Baitussalam dan Seulemeum. Other centers are still classified as rural centers. Further details is described in Table 2.2.1.

Table 2.2.1 City Size Identification

URBAN CENTER	PROJECTED POPULATION	CITY SIZE
KUTA MALAKA	5,614	Rural Center
SIMPANG TIGA	5,897	Rural Center
KOTA JANTHO	6,753	Rural Center
DARUL KAMAL	6,984	Rural Center
PULO ACEH	7,067	Rural Center
LEMBAH SEULAWAH	8,458	Rural Center
LEUPUNG	9,275	Rural Center
KRUENG BARONA JAYA	12,172	Rural Center
KUTA COT GLIE	12,664	Rural Center
LHOONG	13,648	Rural Center
SUKA MAKMUR	14,290	Rural Center
MESJID RAYA	14,455	Rural Center
DARUSSALAM	19,256	Rural Center
LHOKNGA	19,493	Rural Center
INDRAPURI	19,613	Rural Center
BAITUSSALAM	21,401	Small City
SEULIMEUM	22,304	Small City
PEUKAN BADA	22,908	Small City
MONTASIK	23,544	Small City
KUTA BARO	23,673	Small City
INGIN JAYA	25,273	Small City
DARUL IMARAH	40,525	Small City
SABANG	41,227	Small City
BAC	360,304	Medium Size City

Source: Additional Study Team, 2006

CHAPTER 3 INTERACTION AND INTERDEPENDENCY ANALYSIS

3.1 INTERACTION ANALYSIS

Interaction analysis is conducted to analyze the following interactions in the study area: 1) BAC and NAD Province; 2) BAC and regional centers; 3) Regional center and regional center, as elaborated in the following explanation.

a. Interaction of "BAC – NAD"

The interaction of BAC to cities/regencies in NAD eastcoast is stronger than to cities/regencies in the westcoast, such as: Aceh Besar Regency (Jantho), Bireun Regency (Bireun), East Aceh Regency (Langsa), and Aceh Tamiang Regency (Kuala Simpang). The stronger linkage is caused by the following factors: The population is concentrated in eastern NAD Province, Good accessibilities (provided by Eastern Trans-Sumatra highway). Low Interaction linkage between cities in NAD Province with BAC, located in Gayolues Regency (Blankejeran), Aceh Jaya Regency (Calang), Aceh Singkil Regency (Singkil), Bener Meriah Regency, Sabang City, and Simeleu Regency. Low Interaction between BAC and other cities are caused by: Small Population, Far Distance from BAC, Primitive/Remote area, Low Community Accessibility.

Table 3.1.1 Regional Interaction Pattern (BAC with NAD Province)

BAC to - Regency/City NAD	Capital	I Ranking	Description
Pidie	***Sigli***	***1***	***Strongest***
Aceh Utara	***Lhoksukon***	***2***	***Strong***
Biereun	***Biereun***	***3***	***Strong***
Aceh timur	***Langsa***	***4***	***Strong***
Aceh Besar	***Jantho***	***5***	***Strong***
Aceh tamiang	Kuala Simpang	6	Average
Aceh Selatan	Tapaktuan	7	Average
Aceh Barat	Meulaboh	8	Average
Lhoksumawe	Lhoksumawe	9	Average
Aceh Tenggara	Kuta Cane	10	Average
Langsa	Subussalam	11	Low
Aceh Tengah	Takangon	12	Low
Nagan Raya	Suka Makmur	13	Low
Bener Meriah	Simpang Tiga Redelong	14	Low
Aceh Barat Daya	Blangpidie	15	Low
Aceh Singkil	Singkil	16	Low
Aceh Jaya	Calang	17	Low
Gayolues	Blangkejeren	18	Low
Simeleu	Sinabang	19	Low
Sabang	Sabang	20	Low

Source: 2003 Secondary Data Source (Pre-Tsunami), analyzed in 2005

b. Interaction "BAC to Regional Center of Aceh Besar Regency"

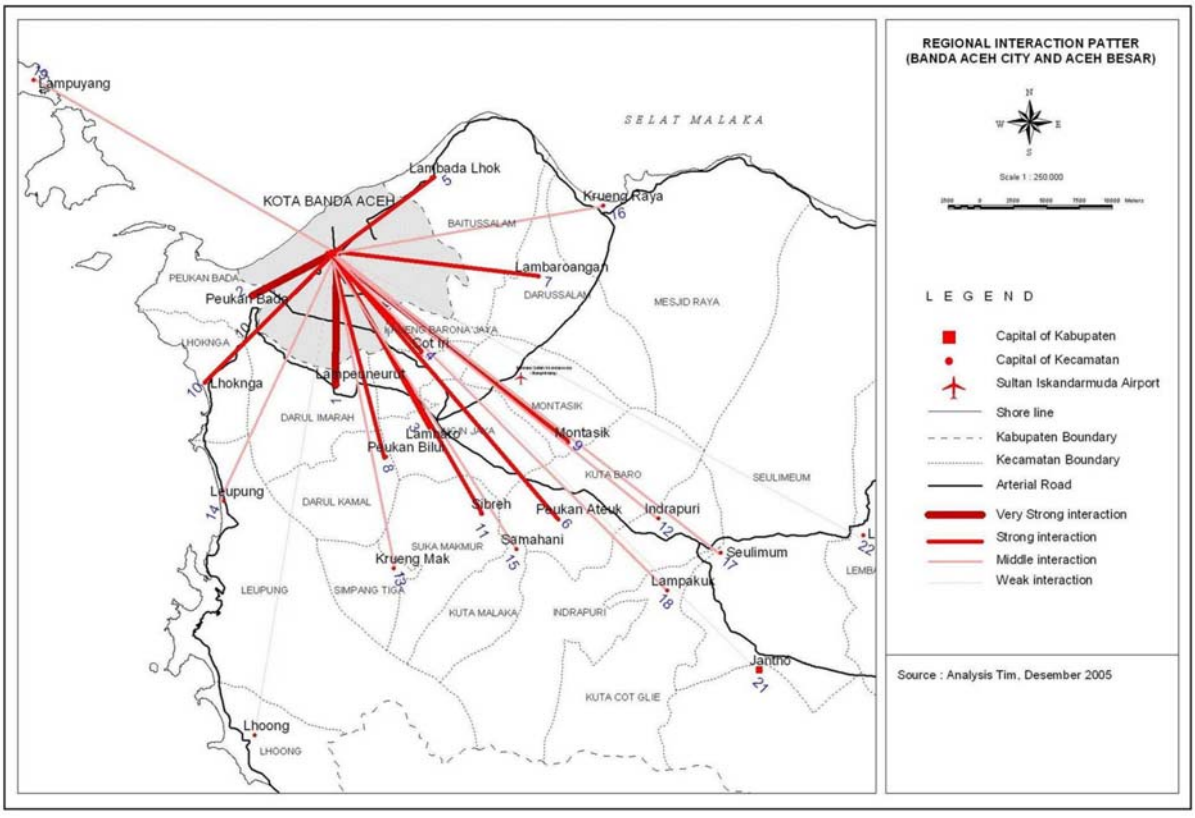
From the regional linkages / Interaction it can be seen that the Capital of Darul Imarah District (Lampeneurut), Ingin Jaya (Lambaro), Kuta Baro (Peukan Ateuk), Montasik (Montasik) and Peukan Bada (Peukan Bada) all have strong linkages with BAC. While the link with the Capital of Kuta Malaka District (Samahani), Simpang Tiga (Krueng mak) is weak. See Table and Figure

Table 3.1.2 Interaction of BAC to Regional Center of Aceh Besar Regency

Interaction	Regional Center	Population	distance	interaction	
BAC to Regional Center of Aceh Besar			Km	Index Point	Ranking
Banda Aceh	-	223.829	-	-	-
Banda Aceh <---> Darul Imarah	***Lapeneurut***	***34.420***	***5***	***308.167.767***	***1***
Banda Aceh <---> Peukan Bada	***Peukan Bada***	***19.457***	***6***	***120.973.357***	***2***
Banda Aceh <---> Ingin Jaya	***Lambaro***	***21.466***	***8***	***75.073.646***	***3***
Banda Aceh <---> Krueng Barona Jaya	***Cot Iri***	***10.338***	***6***	***64.276.228***	***4***
Banda Aceh <---> Baitussalam	***Lambada Lhok***	***18.177***	***11***	***33.624.295***	***5***
Banda Aceh <---> Kuta baro	***Peukan Ateuk***	***20.107***	***12***	***31.253.678***	***6***
Banda Aceh <---> Darussalam	***Lambaro Angan***	***16.355***	***13***	***21.661.085***	***7***
Banda Aceh <---> darul Kamal	***Peukan Bilui***	***5.932***	***8***	***20.746.150***	***8***
Banda Aceh <---> Montasik	***Montasik***	***19.997***	***16***	***17.484.018***	***9***
Banda Aceh <---> Lhoknga	***Lhoknga***	***16.556***	***16***	***14.475.441***	***10***
Banda Aceh <---> Suka Makmur	***Sibreh***	***12.137***	***15***	***12.073.834***	***11***
Banda Aceh <---> Indrapuri	Indrapuri	16.658	25	5.965.670	12
Banda Aceh <---> Simpang Tiga	Krueng mak	5.009	18	3.460.369	13
Banda Aceh <---> Leupung	Leupung	7.878	24	3.061.328	14
Banda Aceh <---> Kuta Malaka	Samahani	4.768	19	2.956.279	15
Banda Aceh <---> Mesjid Raya	Krueng Raya	12.277	31	2.859.468	16
Banda Aceh <---> Seulimeum	Seulimeum	18.944	42	2.403.751	17
Banda Aceh <---> Kuta Cot Glie	Lampakuk	10.756	32	2.351.079	18
Banda Aceh <---> Pulo Aceh	Lampuyang	6.002	30	1.492.691	19
Banda Aceh <---> Lhoong	Lhoong	11.592	54	889.789	20
Banda Aceh <---> Kota Jantho	Kota Jantho	5.736	52	474.809	21
Banda Aceh <---> Lembah Seulawah	Lamtamot	7.184	77	271.207	22

Source: Analysis of Additional Study URRP

Figure 3.1.1 Urban Interaction of BAC – Aceh Besar Regency



c. Interaction of "regional center to regional center of aceh besar regency"

After determining the candidates of cities to be selected as satellite city and growth center, the next analysis is to assess the interaction between those cities, as described in the following table and figure.

- Interaction of "Peukan Ateuk (Kuta Baro) – regional center"

Table 3.1.3 Interaction "Peukan Ateuk (Kuta baro) – regional center"

INTERACTION	Population	Distance fromPeukan Ateuk	INTERACTION	
PEUKAN ATEUK <--> KECAMATAN REGIONAL CENTER	Jiwa	(Km)	Nilai	Rangk
Peukan Ateuk <--> Lhoknga (Lhoknga)	16.556	44,29	17	10
Peukan Ateuk <--> Krueng Raya (Mesjid Raya)	12.277	37,57	17	9
Peukan Ateuk <--> Lambaro Angan (Darussalam)	16.355	35,47	26	6
Peukan Ateuk <--> Lambada (Lhok Baitussalam)	18.177	57,63	11	11
Peukan Ateuk (Kuta baro)	20.107			
Peukan Ateuk <--> Montasik (Montasik)	***19.997***	***11,93***	***283***	***1***
Peukan Ateuk <--> Lambaro (Ingin Jaya)	***21.466***	***15,19***	***187***	***2***
Peukan Ateuk <--> Cot Iri (Krueng Barona Jaya)	10.338	20,79	48	5
Peukan Ateuk <--> Sibreh (Suka Makmur)	***12.137***	***12,2***	***164***	***3***
Peukan Ateuk <--> Lapeneurut (Darul Imarah)	34.420	24,79	113	4
Peukan Ateuk <--> Peukan Bilui (Darul Kamal)	5.932	23,02	23	8
Peukan Ateuk <--> Peukan Bada (Peukan Bada)	19.457	35,69	31	6

Source: 2003 Secondary Data (pre-disaster), analyzed in 2005

See Figure 3.1.3

- Interaction "Montasik – Regional center"

Table 3.1.4 Interaction of "Montasik – Regional center"

INTERACTION	Population	Distance from Montasik	INTERACTION	
MONTASIK <--> KECAMATAN REGIONAL CENTER	P	J	Nilai	Rangk
Montasik <--> Lhoknga (Lhoknga)	16.556	40	21	10
Montasik <--> Krueng Raya (Mesjid Raya)	12.277	33,3	22	9
Montasik <--> Lambaro Angan (Darussalam)	16.355	31,2	34	8
Montasik <--> Lambada (Lhok Baitussalam)	18.177	53,4	13	11
Montasik <--> Peukan Ateuk (Kuta baro)	***20.107***	***11,9***	***284***	***3***
Montasik <--> Montasik (Montasik)	19.997			
Montasik <--> Lambaro (Ingin Jaya)	***21.466***	***11***	***355***	***2***
Montasik <--> Cot Iri (Krueng Barona Jaya)	10.338	16,6	75	6
Montasik <--> Sibreh (Suka Makmur)	***12.137***	***8***	***379***	***1***
Montasik <--> Lapeneurut (Darul Imarah)	34.420	20,6	162	5
Montasik <--> Peukan Bilui (Darul Kamal)	5.932	18,8	34	7
Montasik <--> Peukan Bada (Peukan Bada)	19.457	13,5	213	4

Source: Secondary Data in year 2003 (before earthquake and Tsunami), processed in year 2005

See Figure 3.1.4

- Interaction "Lambaro (Ingin Jaya) – Regional center"

Table 3.1.5 Interaction "Lambaro (Ingin Jaya) – Regional center"

INTERACTION	Population	Distance from Lambaro	INTERACTION	
LAMBARO <--> KECAMATAN REGIONAL CENTER	**P**	**J**	**I**	**Rank**
Lambaro <--> Lhoknga (Lhoknga)	16.556	30,8	37	10
Lambaro <--> Krueng Raya (Mesjid Raya)	12.277	24,1	45	9
Lambaro <--> Lambaro Angan (Darussalam)	16.355	22	73	8
Lambaro <--> Lambada (Lhok Baitussalam)	18.177	44,2	20	11
Lambaro <--> Peukan Ateuk (Kuta baro)	20.107	15,1	189	5
Lambaro <--> Montasik (Montasik)	***19.997***	***11***	***355***	***2***
Lambaro (Ingin Jaya)	21.466		-	
Lambaro <--> Cot Iri (Krueng Barona Jaya)	***10.338***	***7,3***	***416***	***3***
Lambaro <--> Sibreh (Suka Makmur)	12.137	10,6	232	4
Lambaro <--> Lampeneurut (Darul Imarah)	***34.420***	***11,3***	***579***	***1***
Lambaro <--> Peukan Bilui (Darul Kamal)	5.932	9,6	138	6
Lambaro <--> Peukan Bada (Peukan Bada)	19.457	22,2	85	7

Source: Secondary Data in year 2003 (before earthquake and Tsunami), processed in year 2005

See Figure 3.1.5

- Interaction "Cot Iri (Krueng Barona Jaya) – Regional center"

Table 3.1.6 Interaction "Cot Iri (Krueng Barona Jaya) – Regional center"

INTERACTION	Population	Distance fromCot Iri	INTERACTION	
COT IRI <--> KECAMATAN REGIONAL CENTER	**P**	**J**	**Nilai**	**Rank**
Cot Iri <--> Lhoknga (Lhoknga)	16.556	31	18	9
Cot Iri <--> Krueng Raya (Mesjid Raya)	12.277	29,4	15	10
Cot Iri <--> Lambaro Angan (Darussalam)	16.355	27,3	23	8
Cot Iri <--> Lambada (Lhok Baitussalam)	18.177	49,5	8	11
Cot Iri <--> Peukan Ateuk (Kuta baro)	20.107	20,7	49	6
Cot Iri <--> Montasik (Montasik)	***19.997***	***16,6***	***75***	***3***
Cot Iri <--> Lambaro (Ingin Jaya)	***21.466***	***7,3***	***416***	***1***
Cot Iri (Krueng Barona Jaya)	10.338	0	-	
Cot Iri <--> Sibreh (Suka Makmur)	12.137	16,2	48	5
Cot Iri <--> Lapeneurut (Darul Imarah)	***34.420***	***11,6***	***264***	***2***
Cot Iri <--> Peukan Bilui (Darul Kamal)	5.932	9,8	64	4
Cot Iri <--> Peukan Bada (Peukan Bada)	***19.457***	***22,5***	40	7

Source: Secondary Data in year 2003 (before earthquake and Tsunami), processed in year 2005

See Figure 3.1.6

- "Lampeneurut (Darul Imarah) – Regional center"

Table 3.1.7 Interaction "Lampeneurut ***(Darul Imarah)*** – Regional center"

INTERACTION	Population	Distance from Lampeuneurut	INTERACTION	
LAMPENEURUT <--> KECAMATAN REGIONAL CENTER	**P**	**J**	**I**	**Rank**
Lapeneurut <--> Lhoknga (Lhoknga)	16.556	21,1	128	6
Lapeneurut <--> Krueng Raya (Mesjid Raya)	12.277	33,4	38	9
Lapeneurut <--> Lambaro Angan (Darussalam)	16.355	31,3	57	8
Lapeneurut <--> Lambada (Lhok Baitussalam)	18.177	53,5	22	10
Lapeneurut <--> Peukan Ateuk (Kuta baro)	20.107	24,7	113	7
Lapeneurut <--> Montasik (Montasik)	19.997	20,6	162	4
Lapeneurut <--> Lambaro (Ingin Jaya)	***21.466***	***11,3***	***579***	***1***
Lapeneurut <--> Cot Iri (Krueng Barona Jaya)	***10.338***	***11,6***	***264***	***3***
Lapeneurut <--> Sibreh (Suka Makmur)	12.137	20,2	102	7
Lapeneurut (Darul Imarah)	***34.420***		-	
Lapeneurut <--> Peukan Bilui (Darul Kamal)	5.932	12,8	125	5
Lapeneurut <--> Peukan Bada (Peukan Bada)	***19.457***	***12,56***	***425***	***2***

Source: Secondary Data in year 2003 (before earthquake and Tsunami), processed in year 2005

See Figure 3.1.7

- Interaction "Sibreh (Suka Makmur) – Regional center"

Table 3.1.8. Interaction "Sibreh (Suka Makmur) – Regional center"

INTERACTION	Population	Distance from Sibreh	INTERACTION	
SIBREH <--> KECAMATAN REGIONAL CENTER	**P**	**J**	**Nilai**	**Rank**
Sibreh <--> Lhoknga (Lhoknga)	16.556	39,7	13	10
Sibreh <--> Krueng Raya (Mesjid Raya)	12.277	33	14	9
Sibreh <--> Lambaro Angan (Darussalam)	16.355	30,9	21	8
Sibreh <--> Lambada (Lhok Baitussalam)	18.177	53	8	11
Sibreh <--> Peukan Ateuk (Kuta baro)	20.107	12	169	3
Sibreh <--> Montasik (Montasik)	19.997	8	379	1
Sibreh <--> Lambaro (Ingin Jaya)	21.466	10,6	232	2
Sibreh <--> Cot Iri (Krueng Barona Jaya)	10.338	16,2	48	5
Sibreh (Suka Makmur)	12.137	0	-	
Sibreh <--> Lapeneurut (Darul Imarah)	***34.420***	***20,265***	102	***4***
Sibreh <--> Peukan Bilui (Darul Kamal)	5.932	18	22	7
Sibreh <--> Peukan Bada (Peukan Bada)	***19.457***	***31***	25	***6***

Source: Secondary Data in 2003 (before earthquake and Tsunami), analyzed in 2005

See Figure 3.1.8

- Interaction "Peukan Beliu (Darul Kamal) – Regional center"

Table 3.1.9 Interaction "Peukan Beliu (Darul Kamal) – Regional center"

INTERACTION	Population	Distance from Peukan Beliu	INTERACTION	
PEUKAN BELIU <--> KECAMATAN REGIONAL CENTER	**P**	**J**	**I**	**Rank**
Peukan Bilui <--> Lhoknga (Lhoknga)	16.556	32,3	9	9
Peukan Bilui <--> Krueng Raya (Mesjid Raya)	12.277	31,6	7	10
Peukan Bilui <--> Lambaro Angan (Darussalam)	16.355	29,5	11	8
Peukan Bilui <--> Lambada (Lhok Baitussalam)	18.177	51,7	4	11
Peukan Bilui <--> Peukan Ateuk (Kuta baro)	20.107	23	23	5
Peukan Bilui <--> Montasik (Montasik)	19.997	18,8	34	4
Peukan Bilui <--> Lambaro (Ingin Jaya)	***21.466***	***9,6***	***138***	***1***
Peukan Bilui <--> Cot Iri (Krueng Barona Jaya)	***10.338***	***9,8***	***64***	***3***
Peukan Bilui <--> Sibreh (Suka Makmur)	12.137	18,4	21	6
Peukan Bilui <--> Lapeneurut (Darul Imarah)	***34.420***	***12,8***	***125***	***2***
Peukan Bilui (Darul Kamal)	5.932		-	
Peukan Bilui <--> Peukan Bada (Peukan Bada)	19.457	23,7	21	7

Source: Secondary Data in year 2003 (before earthquake and Tsunami), processed in year 2005

See Figure 3.1.1 .

- Interaction "Peukan Bada – Regional Center"

Table 3.1.10. Interaction "Peukan Bada – Regional center"

INTERACTION	Population	Distance from Peukan Bada	INTERACTION	
PEUKAN BADA <--> KECAMATAN REGIONAL CENTER	**P**	**J**	**I**	**Rank**
Peukan Bada <--> Lhoknga (Lhoknga)	***16.556***	***8,59***	***437***	***1***
Peukan Bada <--> Krueng Raya (Mesjid Raya)	12.277	44,3	12	10
Peukan Bada <--> Lambaro Angan (Darussalam)	16.355	42,2	18	9
Peukan Bada <--> Lambada (Lhok Baitussalam)	18.177	64,4	9	11
Peukan Bada <--> Peukan Ateuk (Kuta baro)	20.107	35,6	31	6
Peukan Bada <--> Montasik (Montasik)	19.997	31,5	39	5
Peukan Bada <--> Lambaro (Ingin Jaya)	***21.466***	***22,2***	***85***	***3***
Peukan Bada <--> Cot Iri (Krueng Barona Jaya)	10.338	22,5	40	4
Peukan Bada <--> Sibreh (Suka Makmur)	12.137	31	25	7
Peukan Bada <--> Lapeneurut (Darul Imarah)	***34.420***	***12,56***	***425***	***2***
Peukan Bada <--> Peukan Bilui (Darul Kamal)	5.932	23,71	21	8
Peukan Bada (Peukan Bada)	***19.457***	***0***		

Source: Secondary Data in year 2003 (before earthquake and Tsunami), processed in year 2005

See Figure 2.9.

- Interaction "Lhoknga – Regional center"

Table 2.11. Interaction "Lhoknga – Regional center"

INTERACTION	Population	Distance fromLhoknga	INTERACTION	
LHOKNGA <--> KECAMATAN REGIONAL CENTER	**P**	**J**	**I**	**Rank**
Lhoknga (Lhoknga)	16.556			
Lhoknga <--> Krueng Raya (Mesjid Raya)	12.277	52,96	7	10
Lhoknga <--> Lambaro Angan (Darussalam)	16.355	50,8	10	8
Lhoknga <--> Lambada (Lhok Baitussalam)	18.177	73	6	11
Lhoknga <--> Peukan Ateuk (Kuta baro)	20.107	44,2	17	6
Lhoknga <--> Montasik (Montasik)	19.997	40,1	21	4
Lhoknga <--> Lambaro (Ingin Jaya)	21.466	30,8	37	3
Lhoknga <--> Cot Iri (Krueng Barona Jaya)	10.338	31,1	18	5
Lhoknga <--> Sibreh (Suka Makmur)	12.137	39,76	13	7
Lhoknga <--> Lapeneurut (Darul Imarah)	***34.420***	***21,16***	***127***	***2***
Lhoknga <--> Peukan Bilui (Darul Kamal)	5.932	32,3	9	9
Lhoknga <--> Peukan Bada (Peukan Bada)	***19.457***	***8,59***	***437***	***1***

Source: Secondary Data in year 2003 (before earthquake and Tsunami), processed in year 2005

See Figure 2.10.

- Interaction "Lambada Lhok (Baitussalam) – Regional center"

Table 2.12. Interaction "Lambada Lhok (Baitussalam) – Regional center"

INTERACTION	Population	Distance fromLambada Lhok	INTERACTION	
LAMBADALHOK <--> KECAMATAN REGIONAL CENTER	**P**	**J**	**I**	**Rank**
Lambada Lhok <--> Lhoknga (Lhoknga)	16.556	73	6	10
Lambada Lhok <--> Krueng Raya (Mesjid Raya)	***12.277***	***20***	***56***	***1***
Lambada Lhok <--> Lambaro Angan (Darussalam)	***16.355***	***31***	***31***	***2***
Lambada Lhok (Baitussalam)	18.177	0	-	
Lambada Lhok <--> Peukan Ateuk (Kuta baro)	20.107	57,6	11	6
Lambada Lhok <--> Montasik (Montasik)	19.997	53,44	13	5
Lambada Lhok <--> Lambaro (Ingin Jaya)	21.466	44,22	20	4
Lambada Lhok <--> Cot Iri (Krueng Barona Jaya)	10.338	49,5	8	9
Lambada Lhok <--> Sibreh (Suka Makmur)	12.137	53,1	8	8
Lambada Lhok <--> Lapeneurut (Darul Imarah)	***34.420***	***53,5***	***22***	***3***
Lambada Lhok <--> Peukan Bilui (Darul Kamal)	5.932	51,7	4	11
Lambada Lhok <--> Peukan Bada (Peukan Bada)	19.457	64,4	9	7

Source: Secondary Data in year 2003 (before earthquake and Tsunami), processed in year 2005

See Figure 2.11.

- Interaction "Lambaro Angan (Darussalam) – Regional center"

Table 2.13. Interaction "Lambaro Angan (Darussalam) – Regional center"

INTERACTION	Population	Distance from Lambaro Angan	Interaction	
LAMBARO ANGAN <--> KECAMATAN REGIONAL CENTER	**P**	**J**	**I**	**Rank**
Lambaro Angan <--> Lhoknga (Lhoknga)	16.556	50,8	10	11
Lambaro Angan <--> Krueng Raya (Mesjid Raya)	***12.277***	***11***	***166***	***1***
Lambaro Angan (Darussalam)	16.355		-	
Lambaro Angan <--> Lambada (Lhok Baitussalam)	18.177	31	31	5
Lambaro Angan <--> Peukan Ateuk (Kuta baro)	20.107	35,4	26	6
Lambaro Angan <--> Montasik (Montasik)	19.997	31,2	34	4
Lambaro Angan <--> Lambaro (Ingin Jaya)	***21.466***	***22***	***73***	***2***
Lambaro Angan <--> Cot Iri (Krueng Barona Jaya)	10.338	27,36	23	7
Lambaro Angan <--> Sibreh (Suka Makmur)	12.137	30,9	21	8
Lambaro Angan <--> Lapeneurut (Darul Imarah)	***34.420***	***31,36***	***57***	***3***
Lambaro Angan <--> Peukan Bilui (Darul Kamal)	5.932	29,59	11	10
Lambaro Angan <--> Peukan Bada (Peukan Bada)	19.457	42,27	18	9

Source: Secondary Data in year 2003 (before earthquake and Tsunami), processed in year 2005

See Figure 2.12.

Figure 2.2. Urban Linkage between Peukan Atuk and surrounding area

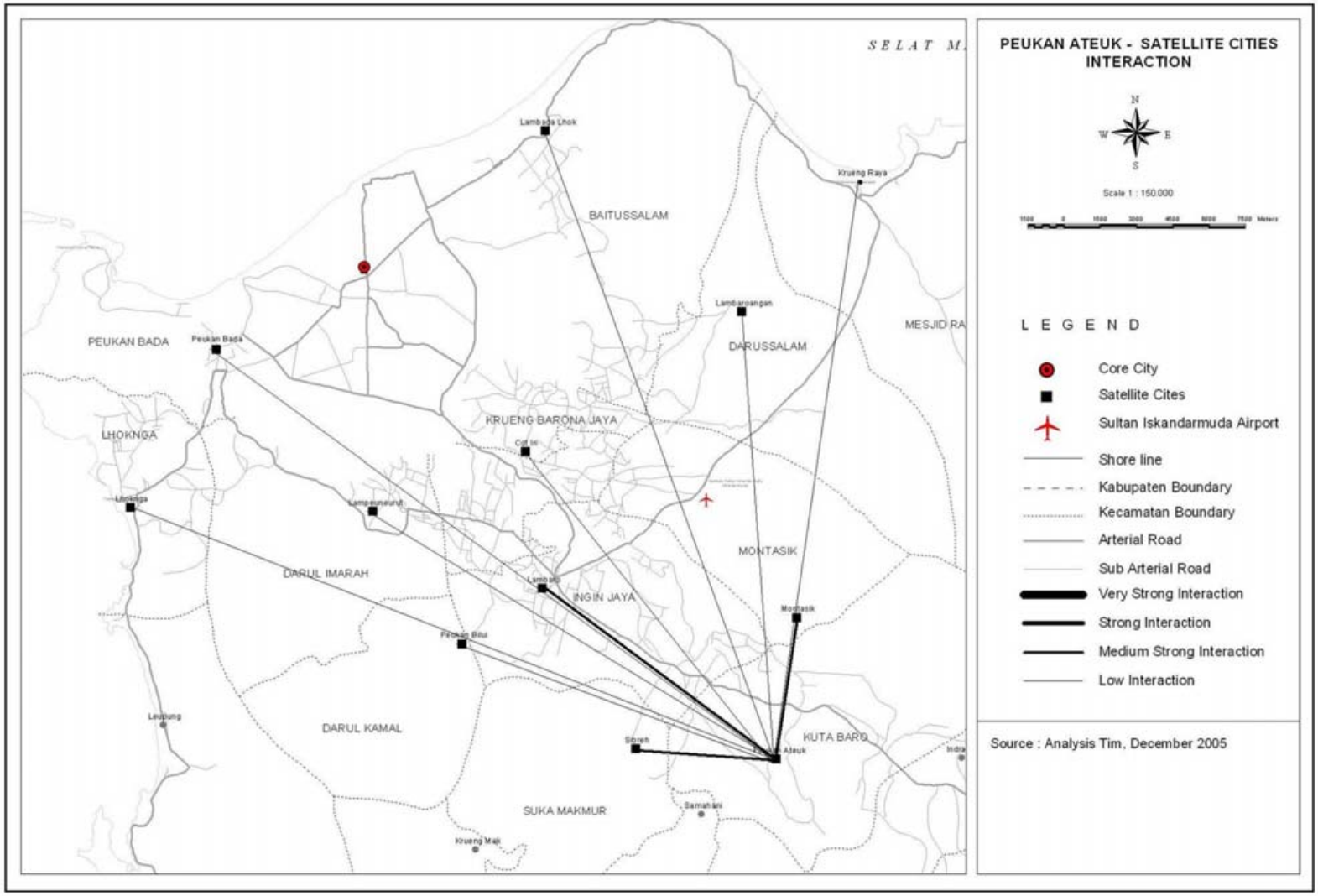


Figure 2.3. Urban Linkage between Montasik and surrounding area

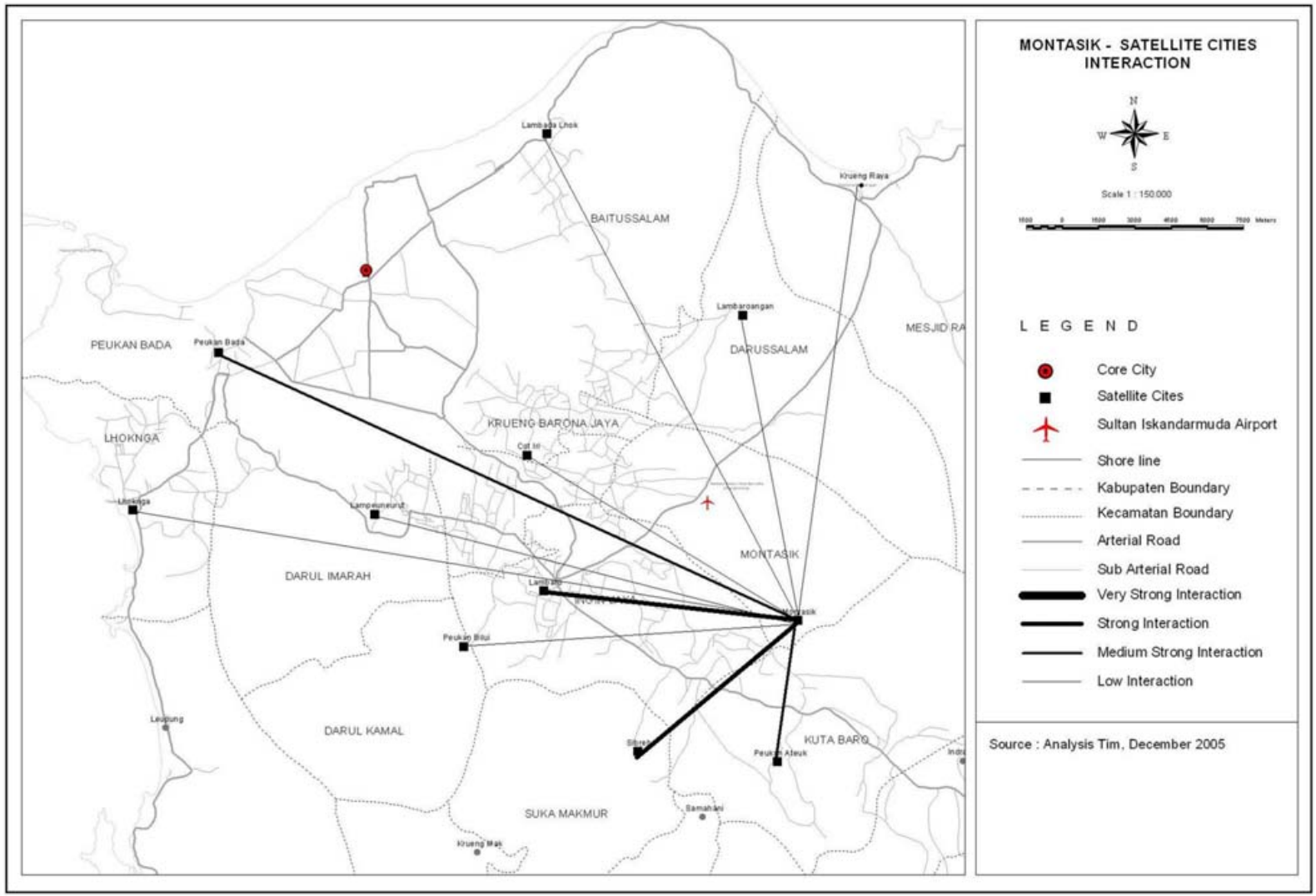


Figure 2.4 Urban Linkage between Lambaro and surrounding area

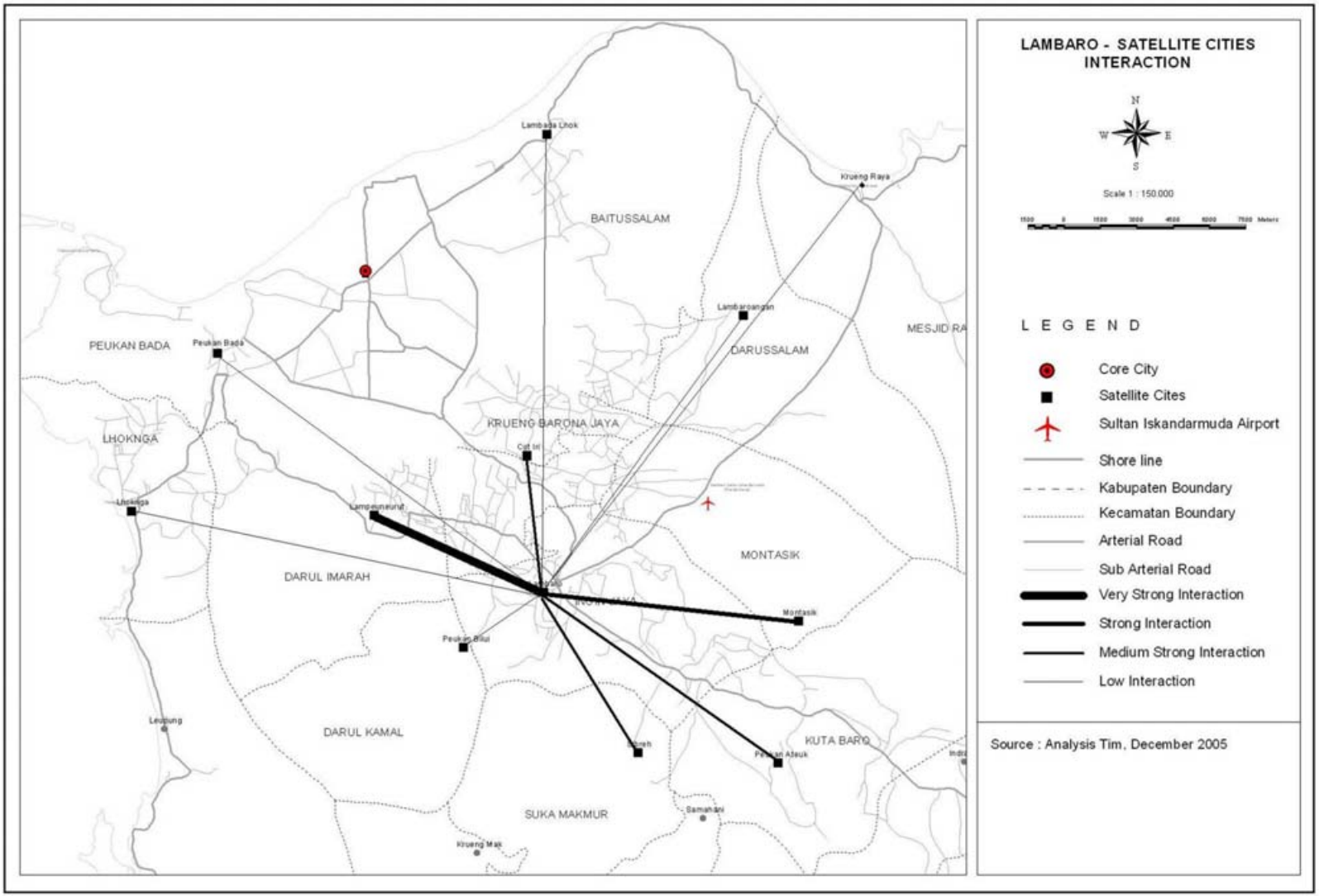


Figure 2.5. Urban Linkage between Cot Iri and surrounding area

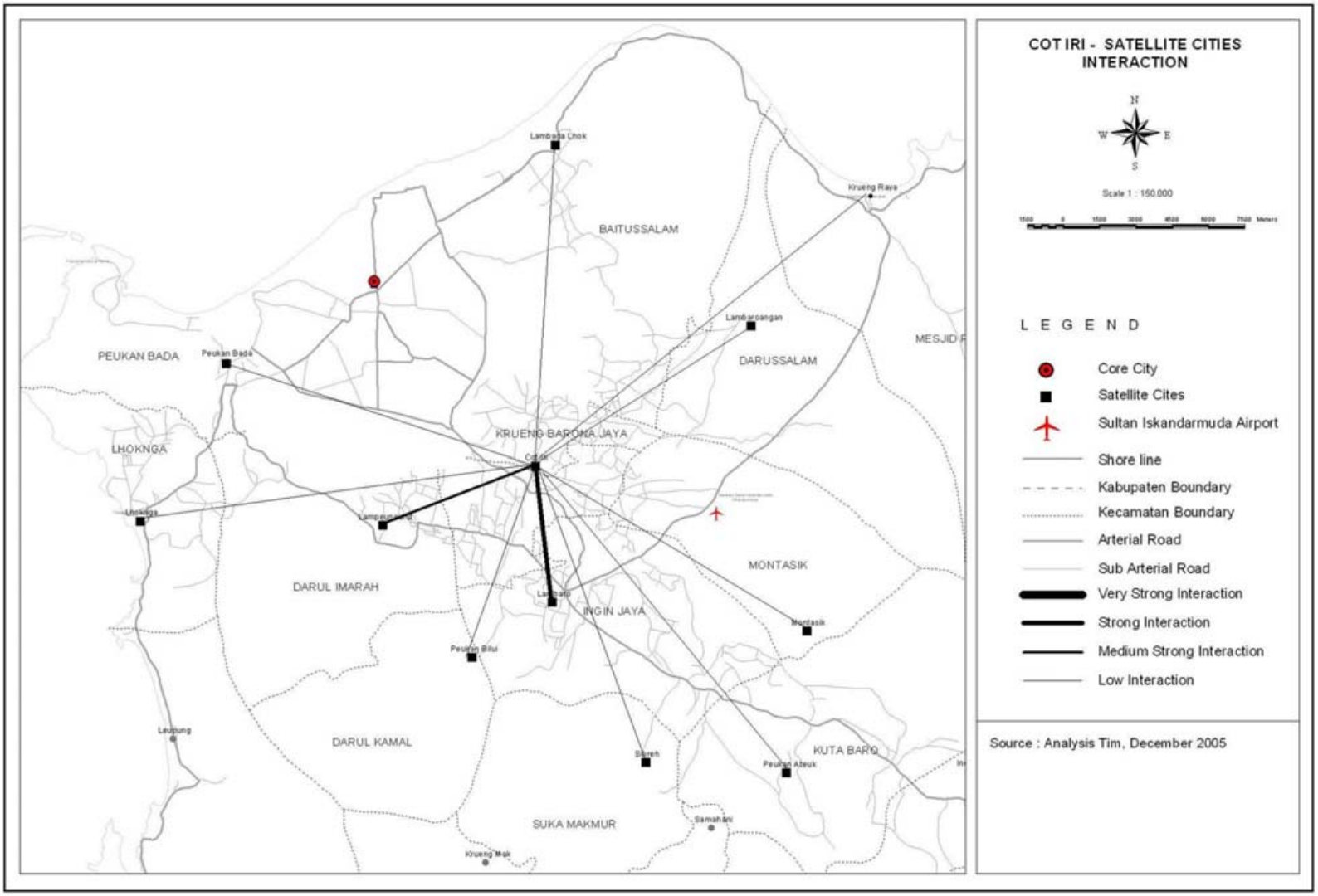


Figure 2.6. Urban Linkage between Lampeuneurut and surrounding area

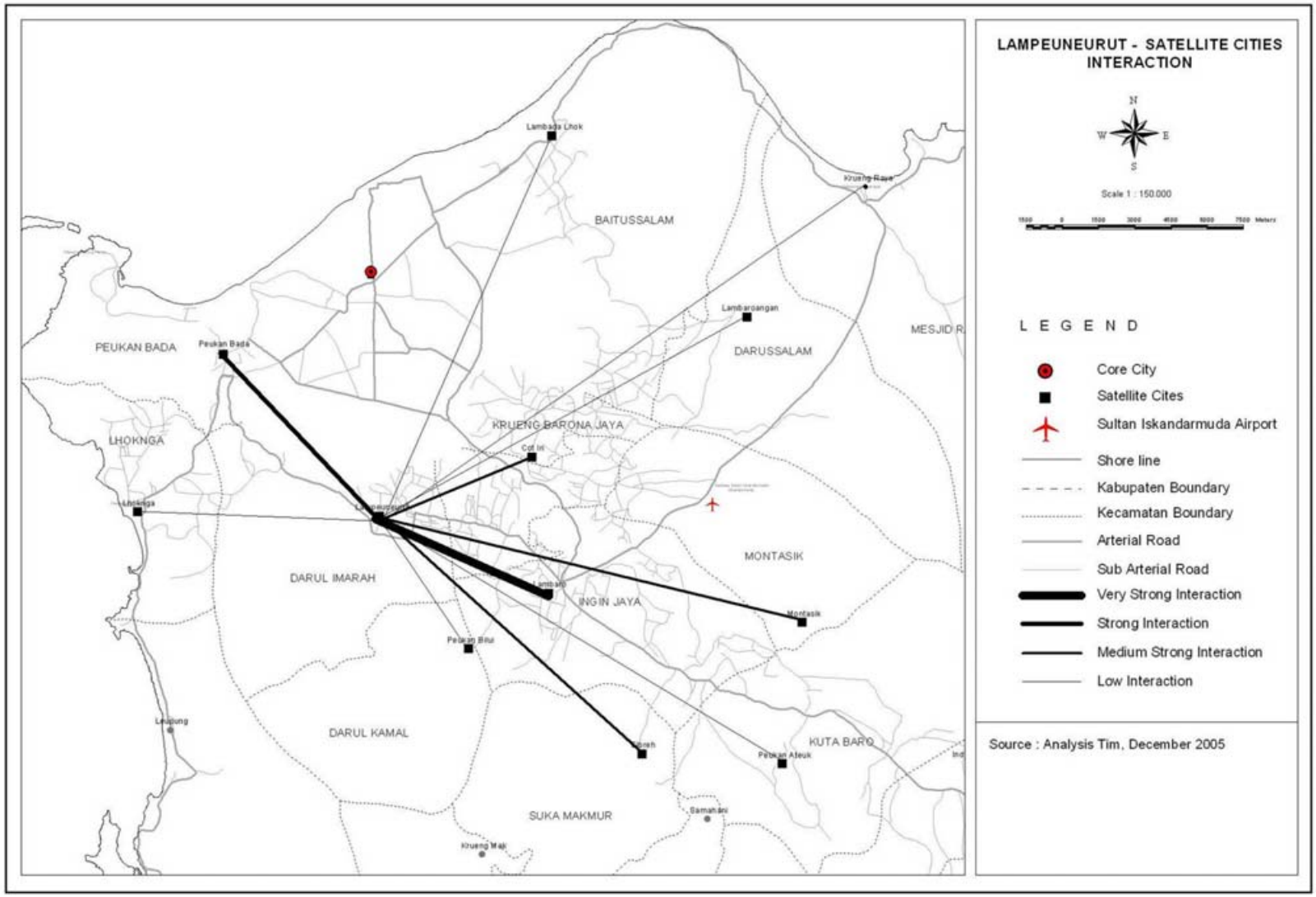


Figure 2.7 Urban Linkage between Sibreh and surrounding area

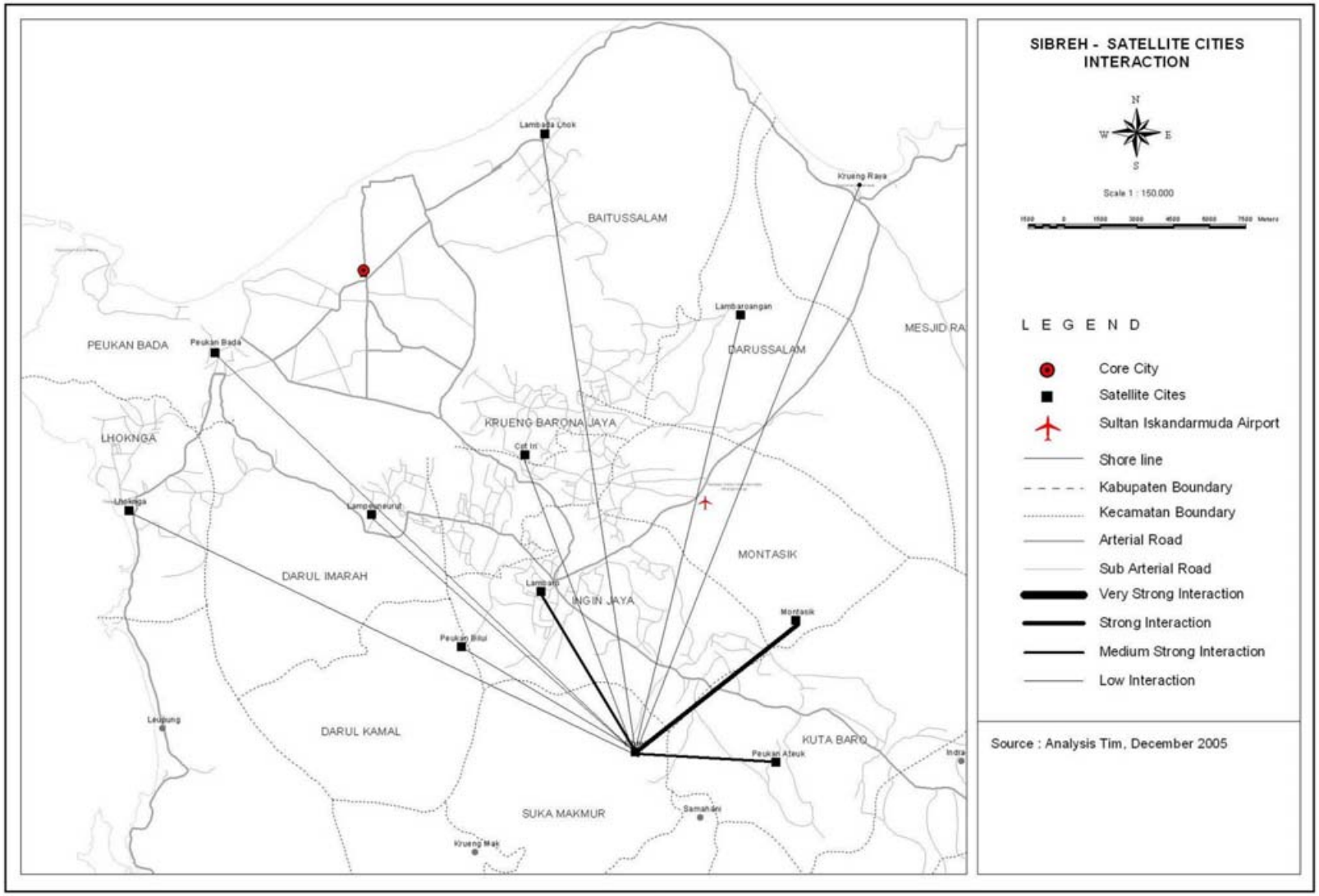


Figure 2.8 Urban Linkage between Peukan Beliu and surrounding area

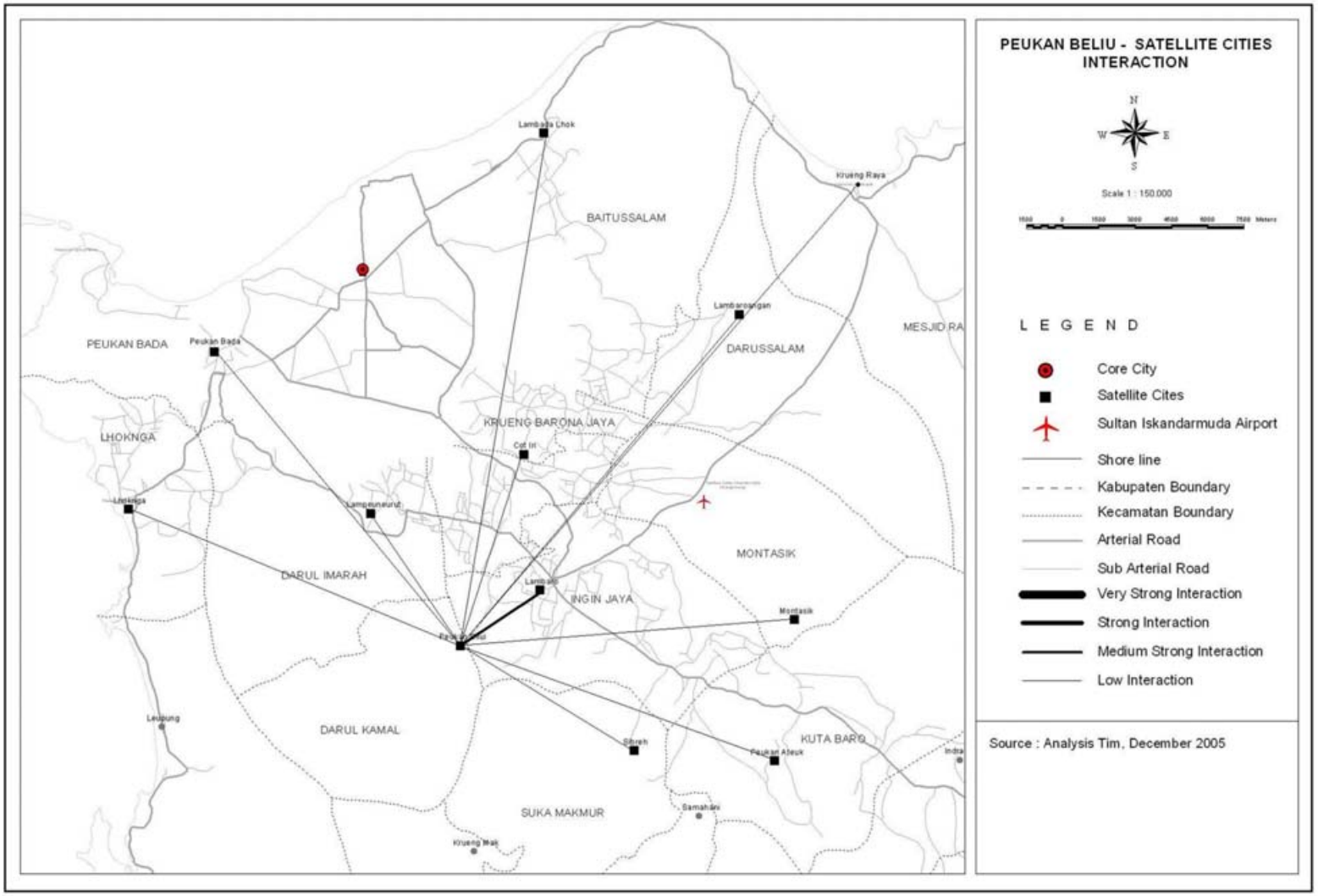


Figure 2.9 Urban Linkage between Peukan bada and surrounding area

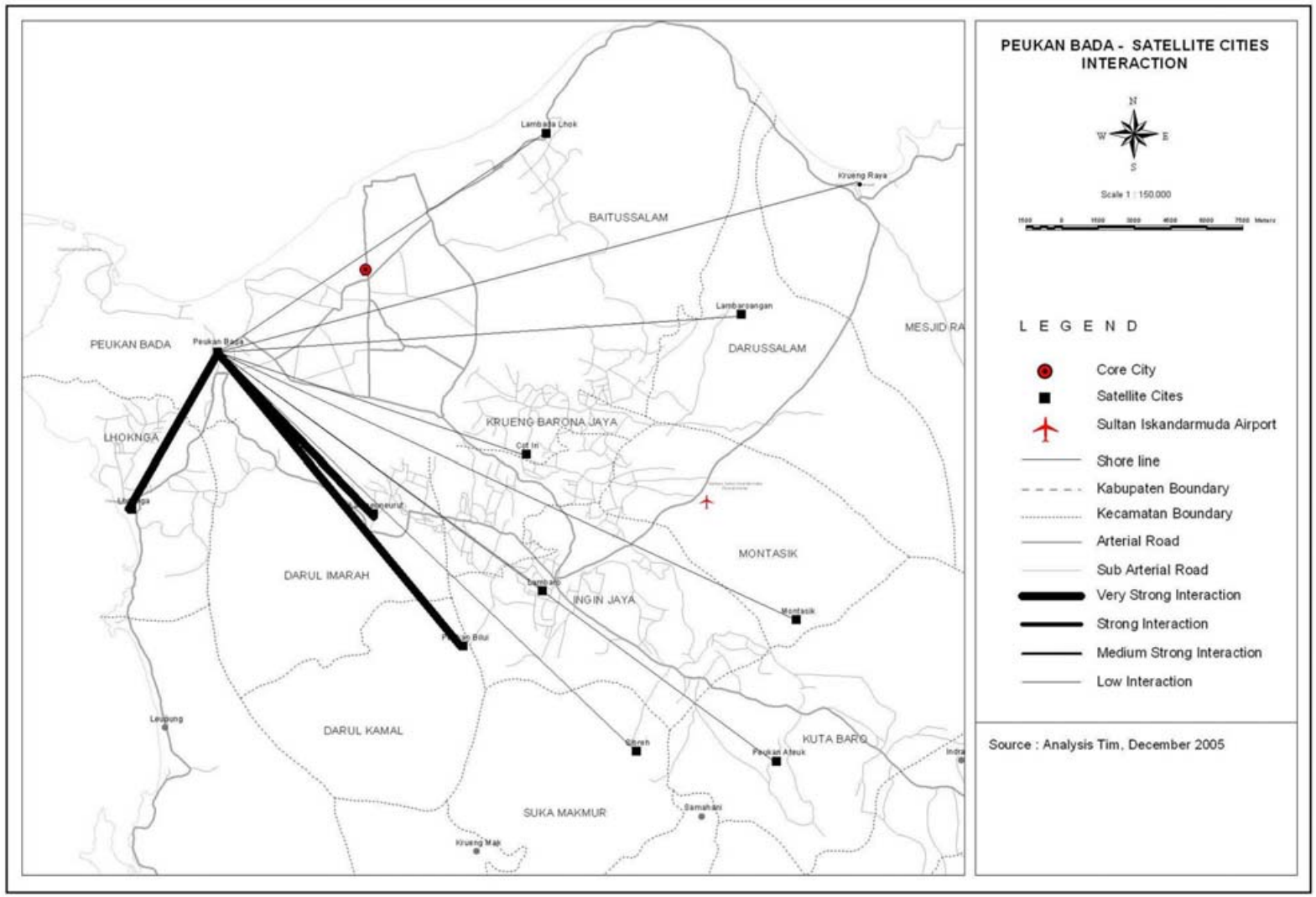


Figure 2.10 Urban Linkage between Lhoknga and surrounding area

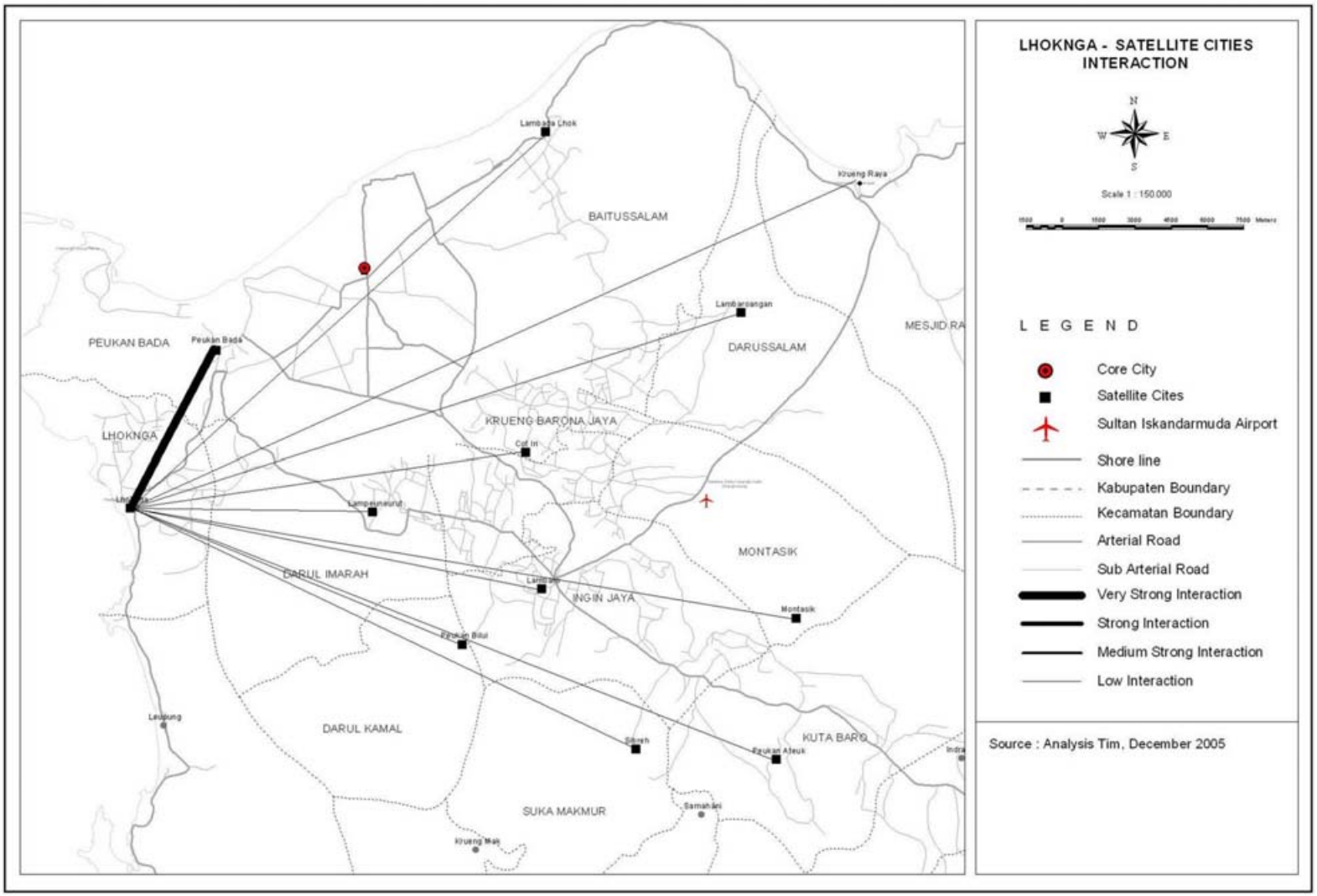


Figure 2.11 Urban Linkage between Lambada Lhok and surrounding area

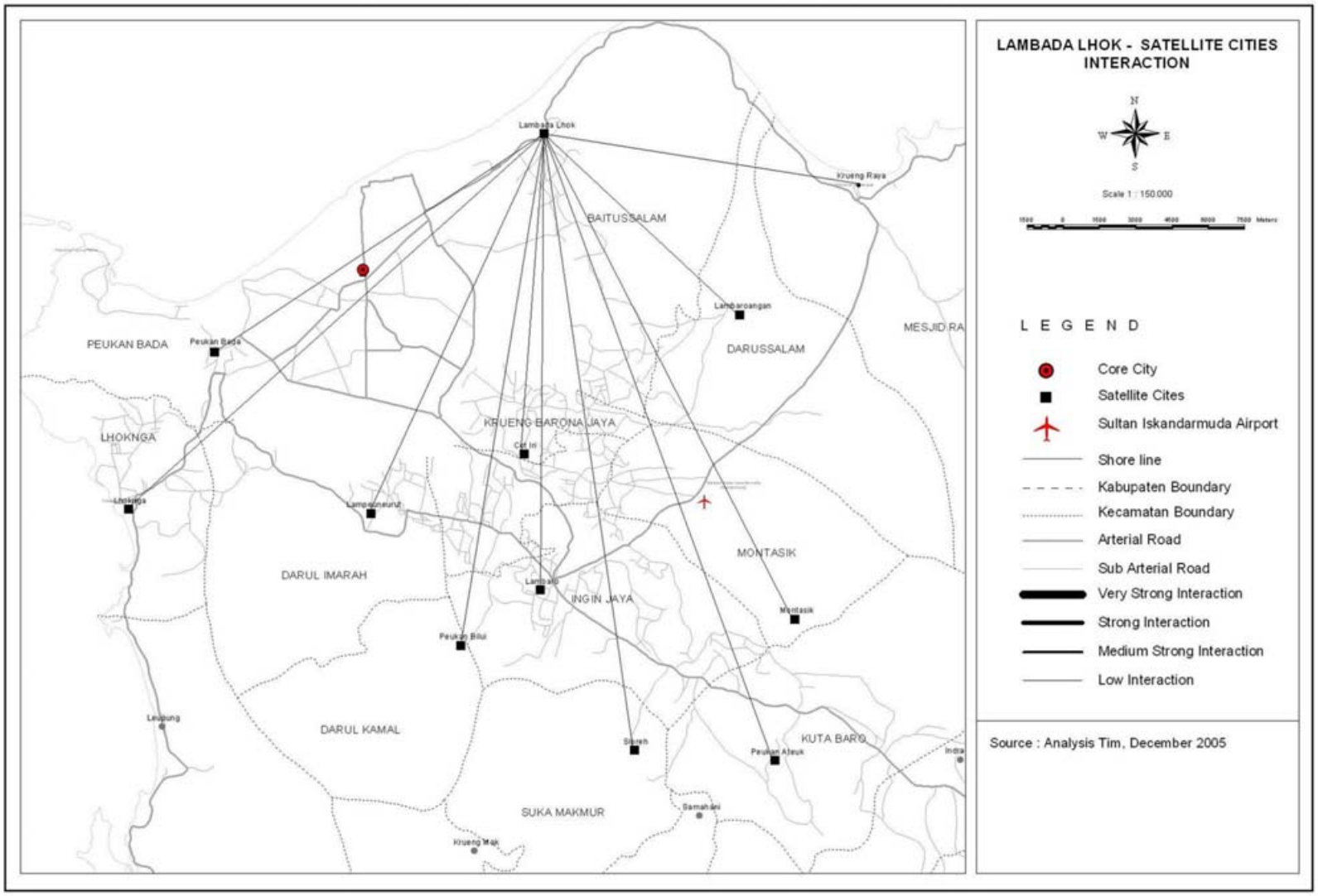
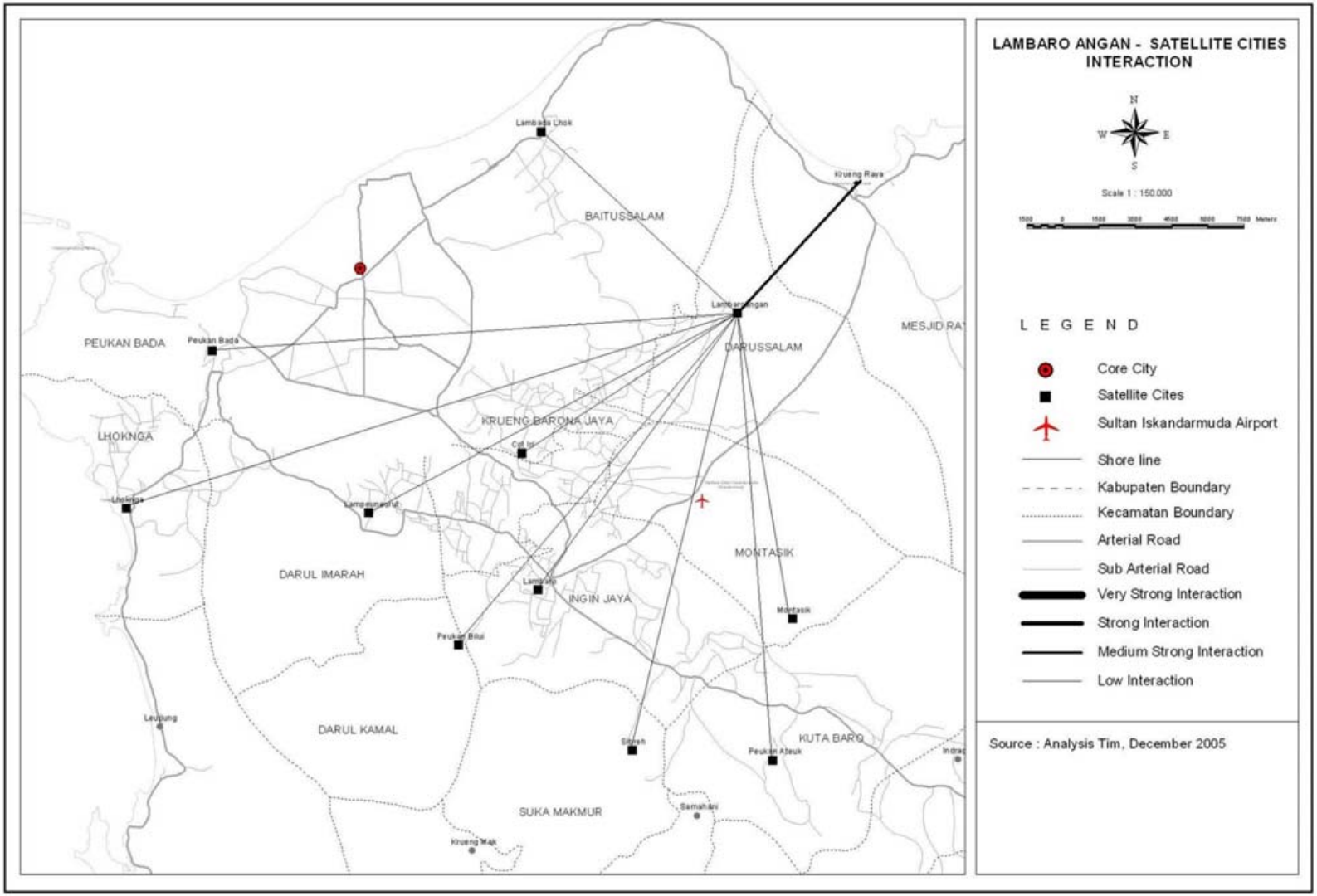


Figure 2.12. Urban Linkage between Lambaro Angan and surrounding area



3.2. ANALYSIS OF INTERDEPENDENCY

The Breaking Point Analysis is conducted in order to study the Interdependency between BAC and other regional center. Through this analysis, the following can be determined: the spatial sizes of surrounding cities, spaces not serviced by core city, independent areas in cities around core city

Table 2.15. Regional Interaction Pattern (BAC and Aceh Besar Regency)

Interdependency	Population	Distance of influence from BAC
BAC to Regional center	People	Km
Banda Aceh	223.829	
Banda Aceh <--> Lhoknga	*16.556*	13
Banda Aceh <--> Darussalam	*16.355*	*10*
Banda Aceh <--> Baitussalam	*18.177*	*9*
Banda Aceh <--> Kuta baro	*20.107*	*9*
Banda Aceh <--> Montasik	*19.997*	*12*
Banda Aceh <--> Ingin Jaya	*21.466*	*6*
Banda Aceh <--> Krueng Barona Jaya	*10.338*	*5*
Banda Aceh <--> Suka Makmur	*12.137*	*12*
Banda Aceh <--> Darul Imarah	*34.420*	*4*
Banda Aceh <--> darul Kamal	*5.932*	*7*
Banda Aceh <--> Peukan Bada	*19.457*	*5*

Source: Secondary Data year 2003 (before earthquake and Tsunami), processed in year 2005

See Figure 2.14. and 2.15.

Figure.2.14. Distance of influence from BAC

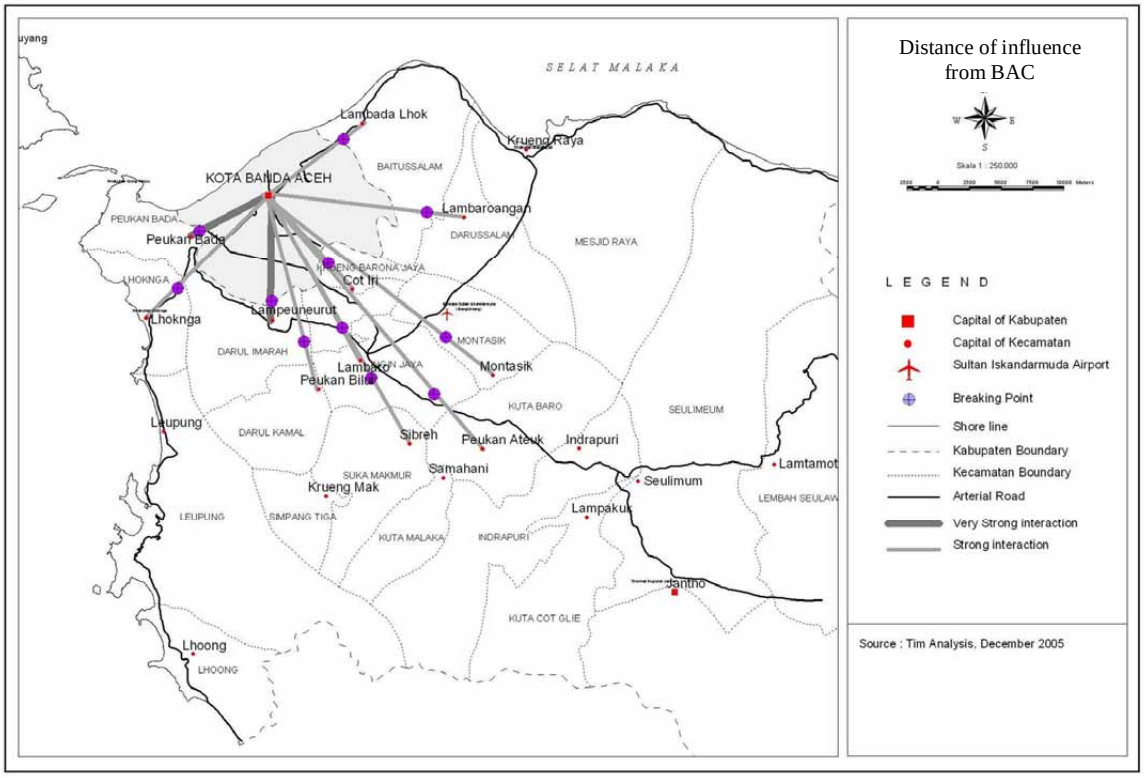
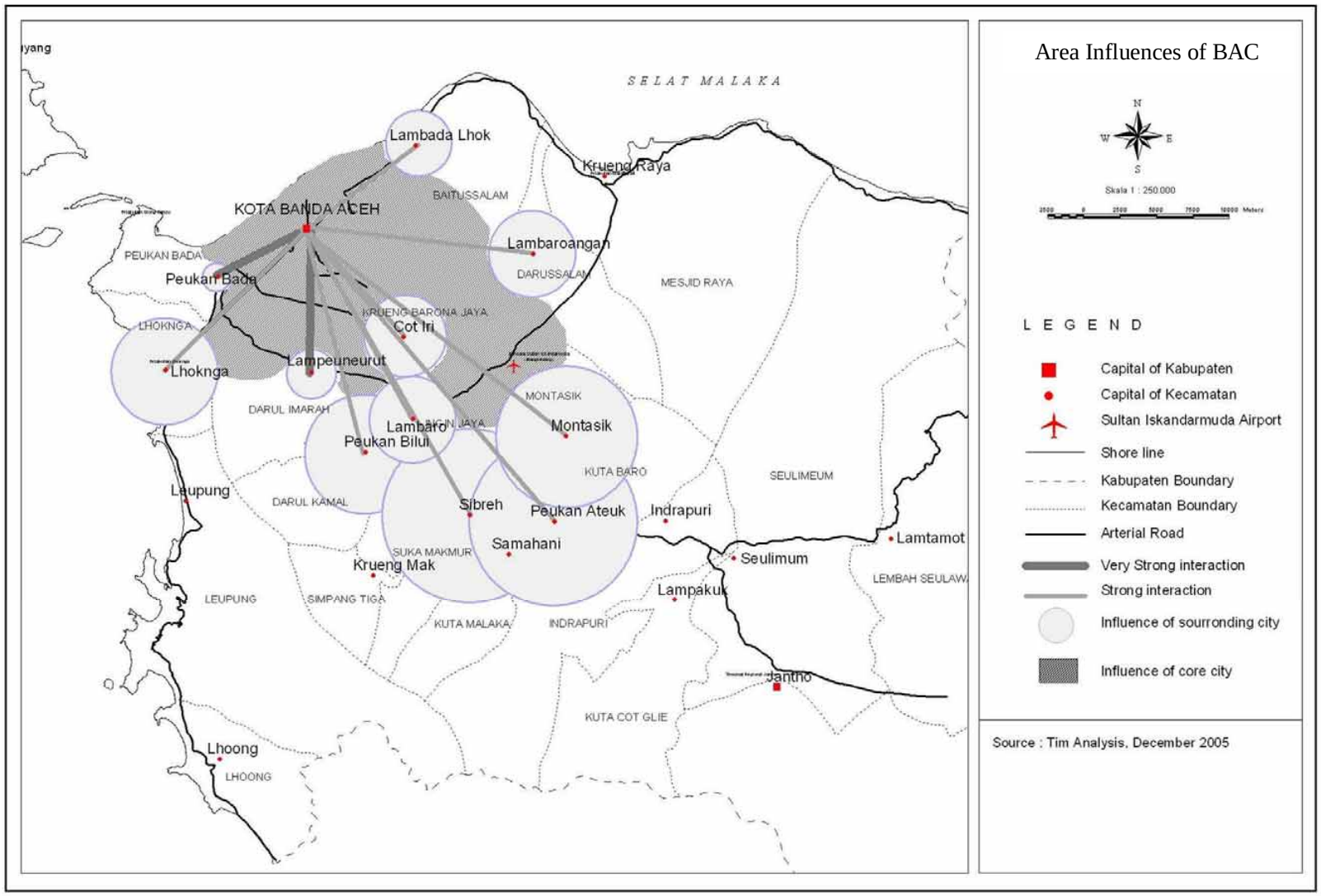


Figure 2.15. Area Influences of BAC



3.3. FUNCTION DEVELOPMENT PLANNING, SERVICES SCALE, AND SWOT ANALYSIS

Table 2.17 SWOT of Cities Function And Hierarchy

No	City	Main Activity	Services Scale	Additional Activity	Argument (SWOT) (Cities Function and Hierarchy)
1	Banda Aceh	▪ Trade and Services ▪ Public and Social Services ▪ Education	▪ City Scale ▪ Regional/Province Scale ▪ National Scale	▪ Housing ▪ Fishery ▪ People and Goods Harbor ▪ Tourism (historical, nature, and shopping) ▪ Land Station	a) Geographic: > Lowland > Has Beach and Shore area b) Population: > High, 200.843 people > Good Human Resources c) City Administrative position > NAD Province Capital City d) Spatial > Orde I in NAD Province Hierarchy system > Bigger Land proportion development > Sport Center Area > UNSYIAH and other universities > Primary Facilities (Office, Governance, economic, health, trade, services, etc) e) Infrastructure > Good cities infrastructure and utilities f) Transportation > Railway Plan > Ulee Lheue Harbor > LRT Plan (Light Rail Transit) g) Others > Tourism Development Plan
2	Sabang	▪ Free Port ▪ Tourism (nature), fishery, plantation ▪ Security and Protection	▪ City Scale ▪ Regional/Province Scale ▪ National Scale ▪ International Scale	▪ Housing ▪ Government and Private Office	a) Geographic: > *The strategic location in* $05^0$46’28”-$05^0$54’28” North Star and $95^0$13’02”-$95^0$22’36” East Longitude > Lowland and hill

No	City	Main Activity	Services Scale	Additional Activity	Argument (SWOT) (Cities Function and Hierarchy)
		▪ Industry ▪ Free Trade Zone			> Has Beach and Shore area > Private island b) Population > High, 26.505 people, growth 3,75% > Good Human Resources c) City Administrative positions > City d) Spatial > Orde II in NAD Province Hierarchy system > One of the priority area *(fishery, plantation, tourism sectors, and improving the security and protection*) e) Potency > *Tourism* forest size 1.413,50 Ha (9%) in Sukakarya district > Tourism object: *Beach, aneuk lot lake, Keunekaitaman hot water source, cave, sabang bay, and West Indonesia 0 Km Monument* > *Potential economic sector is: mining sector, trade, hotel, and restaurant*[l] f) Transportation > Having Kuala Langsa Harbor and Balohan Harbor > Maimun Saleh airport (class II) that prepared for the public flight g) Others > Based on UU No.37 Thn 2000 relating to Sabang Island Development into Free Trade Area and Free Port. > High risk area for earthquake and tsunami disaster

No	City	Main Activity	Services Scale	Additional Activity	Argument (SWOT) (Cities Function and Hierarchy)
3	Lhok Nga	▪ Trade ▪ Upstream industries (Andalas cement) ▪ Downstream industry ▪ Nature tourism (beach)	▪ City Scale ▪ Regional/Province Scale ▪ National Scale ▪ International Scale	▪ Housing ▪ Local scale Government office ▪ Cultivation and Plantation ▪ Fishery	a) Geographic: > Plain to hill > *Strategic* position located in west sea front that has direct access to abroad (export) b) Population > 16.556 people > Low population growth c) Administrative City Position > District d) Spatial > Included central in SWP (Satuan Wilayah Pembangunan) VII e) Potency > Material available > Beach tourism. coal mine > Developing downstream industry > Biggest Basic Industries and Various Industries Amount in Aceh Besar Regency[2] f) Transportation > Lhoknga Harbor as private harbor (belong to PT. SAI, Mobil Oil Indonesia, PT. PIM, PT. AAF , operated for those company) > "Ladia Galaska" Route Expansion through West corridor (Banda Aceh-Lhoknga-Maelaboh) g) Others > High Risk area for the earthquake and tsunami
4	Lambaro	▪ Trade center (agriculture) ▪ Land station center "Multi Moda" ▪ Cultivation and Plantation	▪ City Scale ▪ Regional/Province Scale	▪ Housing ▪ Local scale Government office ▪ Small industry	a) Geographic: > Plain to hill > *Strategic position* located in cities system crossways between BAC and Aceh Besar Regency b) Population

No	City	Main Activity	Services Scale	Additional Activity	Argument (SWOT) (Cities Function and Hierarchy)
		▪ Cattle			> 21.466 people > Low population growth (1%) c) Administrative city position > District d) Spatial > Included central in SWP (Satuan Wilayah Pembangunan) IV > Lambaro city include in **Hierarchy II** in cities system as service center[3] > There is land use in city center for service trade in local scale. > **Road access** pass by **primary artery** (connecting Banda Aceh with Medan) e) Potency > ***Paddy cultivation*** (production: 19.349 Ton/year) > ***Small Industry*** (203 unit) and Various Industries (3 unit) f) Others > Combining Economic Development Area (KAPET) Bandar Aceh Darussalam, with strategies are: 1) Cultivation, cattle, fishery outlets development in their own strategic city center. 2) Open the transportation route that connected Aceh east coast area to Aceh west coast, therefore result distribution and cultivation need could be effective > Risky for flood > "Terminal Multi Moda" Development
5	Krueng Raya	▪ People and good harbor	▪ Regional/Province Scale ▪ National Scale	▪ Housing ▪ Local Scale	a) Geographic: > Plain to hill

No	City	Main Activity	Services Scale	Additional Activity	Argument (SWOT) (Cities Function and Hierarchy)
		▪ Industrial Area Center ▪ Tourism (Nature)		Government Office ▪ Cultivation	> *Strategic Position* located in east sea front that have the direct access to abroad (export) b) Population > 12.277 people > Average growth (3.65%) c) Administrative city position > District d) Spatial > Include central in SWP (Satuan Wilayah Pembangunan) V > Lambarocity include in **Hierarchy IV** in cities system in Aceh Besar Regency, with function as service center[2] > **Sea Access:** Entering gate in east through the sea > **Land Access: east sea front primary artery** *(connecting Banda Aceh with Medan)* e) Potency > Sea Fishery (Production 17.566 Ton) > Fish Pond (Production 3.979,2 Ton) > Cattle (cow: 7.585, Water buffalo: 3.241, goat: 6.645) > Small Industries (110 unit) and Various Industries (3 unit) > Ujung BateeBeach tourism f) Others > Combining Economic Development Area (KAPET) Bandar Aceh Darussalam, the strategies are: 1) Cultivation, cattle, fishery outlets development in their own strategic city

[2] RTRW Revision Book Aceh Besar Regency year 2003

No	City	Main Activity	Services Scale	Additional Activity	Argument (SWOT) (Cities Function and Hierarchy)
					center. 2) Open transportation route that connecting Aceh east coast area with the west coast area, therefore, the result distribution and cultivation needs are effective > Risky for erosion and earthquake > "industrial area" development
6	Peukan Bada	▪ Fishery ▪ Tourism	▪ Scale Kota	▪ Housing ▪ Local scale government office ▪ Cultivation ▪ Processing small industry ▪ service trade	a) Geographic: > Lowland and hill > Having beach and sea area b) Population > 19.457 people > Average growth (1, 73 %) c) City Administrative position > District d) Spatial > Include central in SWP (Satuan Wilayah Pembangunan) IV > Peukanbada city are included in **Hierarchy III** in Aceh Besar Regency cities system, with function as service center > **Sea Access:** Entering gate from north through sea > **Land Access: west sea front primary artery** (connecting Banda Aceh with Meulaboh) > New city core housing development in Banda Aceh > Area Typology tend to be city e) Potency > ***Sea Fishery*** (Production 8.961,7 Ton) > ***Fishery Pond*** (Production 2918,9 Ton) > ***Cattle*** (Water Buffalo: 3.939)

No	City	Main Activity	Services Scale	Additional Activity	Argument (SWOT) (Cities Function and Hierarchy)
					> ***small Industry (99 unit) and various industry (5 unit)***
					f) Lain-lain > High risk to erosion and earthquake
7	Lampeuneurut	▪ New Housing ▪ Trade ▪ Tourism ▪ Military area	▪ City Scale ▪ city and regional scale ▪ city and regional scale ▪ regional and national scale	▪ local scale government office ▪ Cultivation, plantation and cattle	a) Geographic: > lowland and hill b) Population > 34.420 people > Average growth (1, 36 %) c) City Administrative Position > District d) Spatial > Include central in SWP (Satuan Wilayah Pembangunan) IV > Lampeuneurut city included in **Hierarchy I** in Aceh Besar Regency cities system, with function as service centre > **land Access:** near with BAC > new housing Growth BAC Core > area Typology tend to be cities e) Potency > small Industry (150 unit) and Various Industry (2 unit) > Hot water Tourism > 5 unit market f) Transportation g) Infrastructure h) Lain-lain > High risk to slide off and flood
8	Cot Iri	▪ Trade ▪ New Housing	▪ City and local Scale	▪ Local scale government office	a) Geographic: > lowland and hill

No	City	Main Activity	Services Scale	Additional Activity	Argument (SWOT) (Cities Function and Hierarchy)
				▪ processing small Industry ▪ Cultivation and Plantation ▪ Cattle	b) Population > 10.338 people > Average growth (3, 16 %) c) City Administrative Position > District d) Spatial > Included central in SWP (Satuan Wilayah Pembangunan) IV > Cot Iri city included in **Hierarchy III** in Aceh Besar Regency cities system, with function as service center[3] > **Land Access: near to BAC** > New housing growth in BAC Core > area Typology tend to be cities e) Potency > 2 unit market f) Lain-lain > High risk to slide off and flood
9	Lambada Lhok	▪ Fishery Centre ▪ Trade	▪ City Scale ▪ Local and city scale	▪ local scale government office ▪ Housing ▪ Cultivation and Plantation	a) Geographic: > Lowland > Having beach and sea area b) Population > 18.177 people > High growth (8.41 %) c) City Administrative Position > District d) Spatial > Included central in SWP (Satuan Wilayah Pembangunan) IV

No	City	Main Activity	Services Scale	Additional Activity	Argument (SWOT) (Cities Function and Hierarchy)
					> Lambada lhok city included in **Hierarchy III** in Aceh Besar Regency cities system, with function as service center[4] > **Sea Access:** North entering gate through sea > **Land access: east sea front** *(connecting Banda Aceh – Krueng Raya - Medan)* > New housing growth in BAC Core e) Potency > ***Sea Fishery*** (Production 11.416,7 Ton) > ***Fishery Pond*** (Production 1211,8 Ton) > ***Small industry (99 unit) and Various Industry (5 unit)*** > Cultural Tourism > 1 unit market > TPI f) Transportation g) Infrastructure h) Lain-lain > High risk to earthquake and Tsunami disaster
10	Lambaro Angan	▪ Trade ▪ New Housing	▪ Local scale	▪ local scale government office ▪ Cultivation and Plantation ▪ Cattle	a) Geographic: > Lowland and hill b) Population > 16.355 people > Average growth (2, 06 %) c) City Administrative Position > District d) Spatial > Included central in SWP (Satuan Wilayah Pembangunan) IV

No	City	Main Activity	Services Scale	Additional Activity	Argument (SWOT) (Cities Function and Hierarchy)
					> Lambaro angan city include in **Hierarchy III** in Aceh Besar Regency cities system, with function as service center[5] > **Land access: near to BAC** > New housing growth in BAC Core > Area Typology tend to be cities e) Potency > ***Paddy Cultivation*** (production: 12816 Ton/year) > ***Cattle*** (cow: 11.813, water buffalo: 4.273, goat: 2.468) > ***Small industry (125 unit) and Various Industry (4 unit)*** > ***Cultural Tourism*** > ***2 unit market*** f) Transportation g) Infrastructure h) Lain-lain > High risk to slide off and flood
11	Blang Bintang	▪ Airport ▪ Trade and Services	▪ International Scale ▪ Regional/Province National Scale	▪ Housing ▪ Office ▪ Planned Housing	a) Geographic: > Lowland and hill b) Population > 16.355 people > Average growth (2, 06 %) c) City Administrative Position > Blangbintang City included in district administrative Montasik d) Spatial

No	City	Main Activity	Services Scale	Additional Activity	Argument (SWOT) (Cities Function and Hierarchy)
					> Included central in SWP (Satuan Wilayah Pembangunan) IV > **Land Access: near to BAC** > **air access: having Sultan Iskandar Muda airport (international airport)** > Area Typology tend to be village e) Potency > new city development which united with airport area > There is international scale airport f) Transportation g) Infrastructure h) Lain-lain > High risk to slide off and flood
12	Peukan Bilui	▪ Cultivation Central Area (cattle)	▪ Local scale	▪ local scale government office ▪ local scale Trade ▪ Housing	a) Geographic: > hill b) Population > 5.932 people > Low growth (0.36 %) c) City administrative position > District d) Spatial > Included central in SWP (Satuan Wilayah Pembangunan) IV > Peukan Beliu city included in **Hierarchy IV** in system Aceh Besar Regency cities system, with function as service center > **Closest Access to Lambaro city** > Area Typology tend to be village e) Potency > ***Cattle*** (cow: 9.231, Water buffalo: 2.928, goat: 3.065) > ***1 unit market***

No	City	Main Activity	Services Scale	Additional Activity	Argument (SWOT) (Cities Function and Hierarchy)
					> High risk to slide off
13	Sibreh	▪ Cultivation Central Area	▪ Local Scale	▪ Local Scale Government Office ▪ Local Scale Trade ▪ Housing	a) Geographic: > Plain and hill b) Population > 12.137 people > Low growth (1.5 %) c) City Administrative Position > District d) Spatial > Included central in SWP (Satuan Wilayah Pembangunan) IV > Sibreh City included in **Hierarchy II** in Aceh Besar Regency cities system, with function as service center[6] > **Closest Access to Lambaro City** > area Typology tend to be village e) Potency > ***Paddy Cultivation*** (production: 17.304 Ton/Year) > ***Cattle*** (cow: 7.529, Water buffalo: 5.574, goat: 5.938) > **small industry *(105 unit) and Various industries*** (2 unit) > ***2 unit market*** f) Transportation g) Infrastructure h) Lain-lain > High risk to slide off and flood
14	Peukan Ateuk	▪ Cultivation Central Area	▪ City Scale	▪ Local scale government office	a) Geographic: > Plain and hill

No	City	Main Activity	Services Scale	Additional Activity	Argument (SWOT) (Cities Function and Hierarchy)
				▪ Local scale Trade ▪ Housing	b) Population > 12.137 people > Low growth (1.5 %) c) City Administrative Position > District d) Spatial > Included central in SWP (Satuan Wilayah Pembangunan) IV > Peukan ateuk city included in **Hierarchy III** in Aceh Besar Regency cities system, with function as service center[7] > **Closest access to Lambaro city** > **Road Access** which is passed by **primary artery** *(connecting Banda Aceh with Medan)* > Area Typology tend to be village e) Potency > ***Paddy Cultivation*** (production: 14.445 Ton/Year) > ***Cattle*** (cow: 9422, goat: 9282) > ***5 unit market*** f) Lain-lain > High risk to **slide off** and flood
15	Montasik	▪ Cultivation Central Area	▪ Local Scale	▪ Local Scale government office ▪ Local scale Trade ▪ Housing	a) Geographic: > hill b) Population > 19.997 people > Low growth (1.1 %) c) City Administrative Position > District d) Spatial

No	City	Main Activity	Services Scale	Additional Activity	Argument (SWOT) (Cities Function and Hierarchy)
					> Included central in SWP (Satuan Wilayah Pembangunan) IV > Montasik City included in **Hierarchy III** in Aceh Besar regency cities system with function as service center[8] > **Closest Access to Lambaro city** > Area Typology tend to be village e) Potency > ***Paddy Cultivation*** (production: 30.916 Ton/Year) f) Lain-lain > High risk to **slide off**

APPENDIX C

PROPOSED BANDA ACEH CITY STRUCTURE PLAN

CHAPTER 1 INTRODUCTION

The formulation of proposed structure plan for BAC is based on the following steps:

1) Prior to the earthquake and tsunami disaster, BAC already had a 10 year spatial plan (2000-2010) known **as RTRW BAC for Target Year 2010**. Its planning area covers BAC administrative area, while its planning unit is the BWK (Planning Zones), 2) On 26 December 2004 an earthquake and tsunami hit the area, causing large scale destruction and alteration of spatial structure, 3) On the other hand, the disaster triggered a need for spatial guide for the rehabilitation and reconstruction and development, 4) The central government quickly took action, therefore they prepared a guideline for spatial planning called the **blue print**, which has no definite time frame. The study area covers NAD and Nias (including BAC), planning unit: zones, 5) Considering that the blue print is temporary in nature, the Government of Japan offers a program named **URRP (2009).** This is done because several activities and programs have begun to be carried out. Its planning horizon is in 2009, the study area: BAC and frontier areas, planning unit: ecological and administrative zones (combining Blue Print, RTRW) 6) **Additional Study on URRP** is meant to supplement, such as by extending the planning to 2015, study area: BAC and surrounding areas, planning unit: planning zone and ecological zones.

The material covered in the Proposed Structure Plan BAC is: 1) Projected population 2015; 2) Urban System 2015 3) Urban Hierarchy 2015 4) Urban skeleton 2015 5) Urban Pattern 2015; 6) Primary Land Use 2015, including primary economic, public and social facilities, Natural environment conservation 7) Preliminary infrastructure plan 2015: roads, drainage and flood control, water supply, waste water, solid waste, electrical, telecommunication, maritime and air transport. 8) Urban development concept: Green City Concept, Cyber City Concept, Tourism Development Concept, Industrial Development Concept, Non Polluted, Mass Transport Concept, Disaster Mitigation.

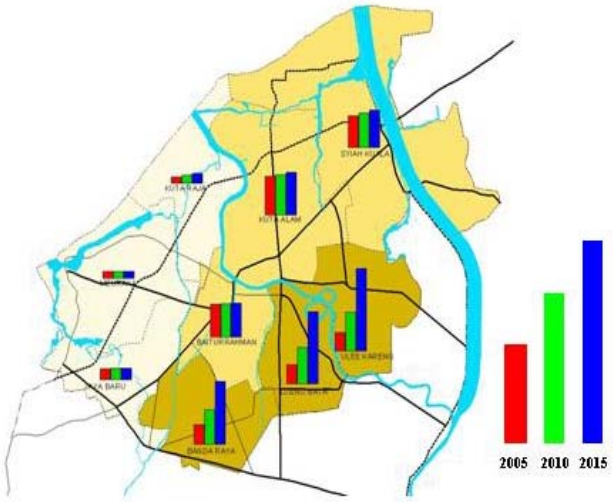
CHAPTER 2 PROJECTED POPULATION

The population projection of BAC is still based on URRP Study with a planning horizon up to 2009 and will be projected further until 2015 using the same rate.

The projected population of BAC for target year 2009 and 2015 is based on scenario for each planning zone, 1) coastal zone and eco-zone with low population scenario (including Jaya Baru, Meuraxa, Kuta Raja Districts) 2) zone of traditional city center with medium population scenario (e.g. Baiturrahman, Kuta Alam and Syah Kuala Districts) 3) urban development zone with high population scenario (e.g. Banda Raya, Lueng Bata and Ulee Kareng Districts).

The total BAC population in 2015 will be 360,304, with the following break down: Ulee Kareng 23%, Lueng Bata 20%, Banda Raya, 18%, Kuta Alam 12%, Syah Kuala 10%, Baiturrahman 9%, Jaya Baru 3%, Kuta Raja 2%, Meuraxa 1%. Further detail is listed in Table 1.

Figure 1 Projected Population in 2015



Source: Additional Study Team, 2006

Table 1Projected Population

District	Projection					
	2005	2006	2007	2008	2009	2015
MEURAXA	5.661	5.667	5.671	5.677	5.683	8061
BAITURRAHMAN	36.894	37.012	37.152	37.303	37.480	53166
KUTA ALAM	43.507	43.929	44.392	44.906	45.484	64519
ULEE KARENG	20.196	24.237	28.472	32.886	37.658	53419
JAYA BARU	11.362	11.375	11.388	11.402	11.417	16195
BANDA RAYA	21.225	24.415	27.737	31.185	34.784	49341
LUENG BATA	20.637	24.098	27.788	31.727	36.144	51270
SYAH KUALA	35.985	36.501	37.086	37.767	38.559	54696
KUTA RAJA	5.376	5.659	5.981	6.353	6.791	9633
TOTAL	200.843	212.893	225.667	239.206	254.000	360.304

Source: Additional Study Team, 2006

CHAPTER 3 SPECIAL THEME IN BAC DEVELOPMENT

3.1 GREEN CITY CONCEPT

(1) Definition

– Definition of a Green City

Green city is defined as a city that implements a principle of balance between built environment and natural environment in order to guarantee a sustainable development.

– Elements of a Green City

Green city elements includes: urban forest, city parks, protected conservation area (river, marshland, coastal area, hills), waste treatment system, the community's social behavior, city policy and regulation in order to guarantee the sustainability of ecosystem.

– Handling/management

Efforts to achieve green city is through the following: Conservation, Preservation and Rehabilitation of urban elements by considering these principles: environmental principles; economic principles and social principles.

(2) Nature and Environment Condition of BAC

The earthquake and tsunami disaster had caused a tremendous environmental destruction and pollution in BAC, with direct implications to public and environmental health. The destruction consists of:

- Sea, water, land and soil pollution, triggering a scarcity of clean water supply and creating serious implications to public health
- Alteration of shoreline
- Pollution and destruction of coral reefs and mangrove
- Reduction/extinction of fish resources and coastal species (biodiversity potentials)
- Destruction of wetlands ecosystem
- Destruction of built ecosystem (cultivated, harbor and fishing villages), bringing significant impacts on economic activities

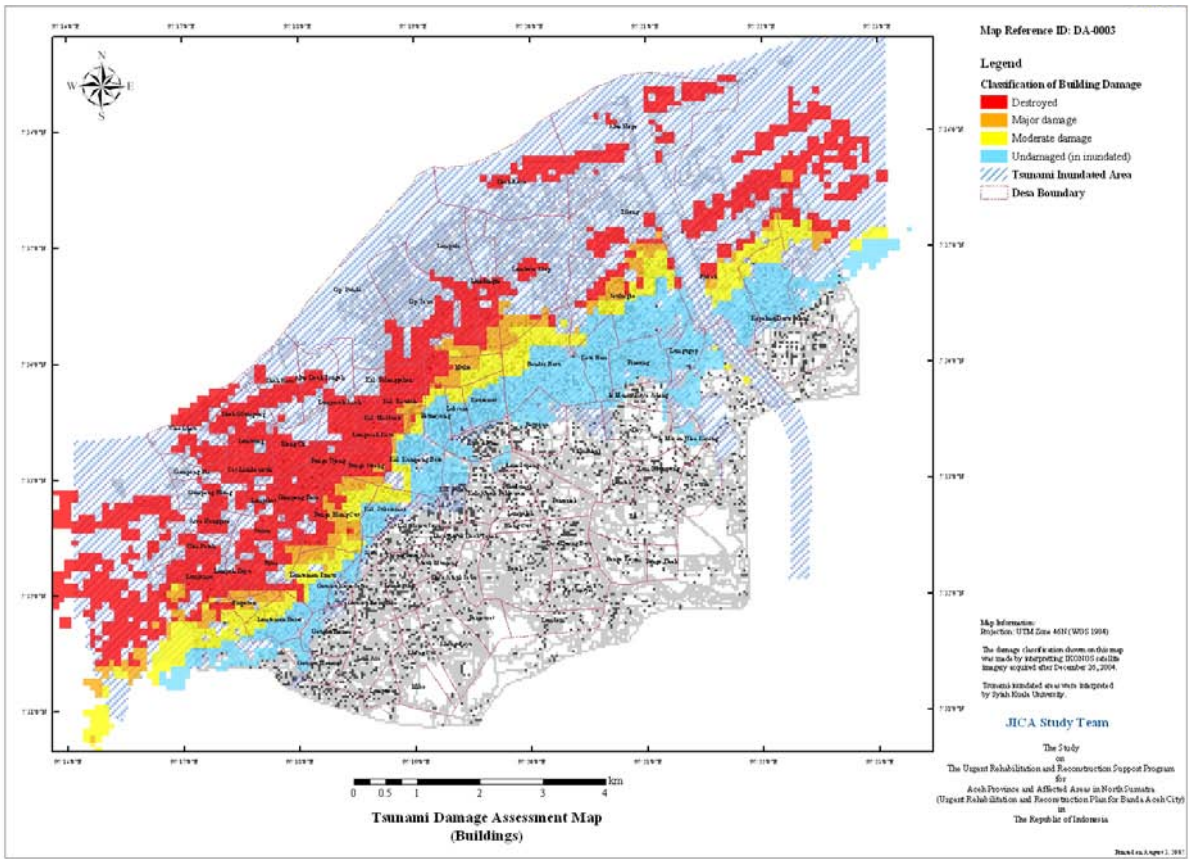
Based on URRP map (*Tsunami Damage Assessment Map)* the degree of nature and environmental damage is as described in the following table and map:

Table 3.1.1 Degree of Nature and Environmental Tsunami Damage in BAC

No	Degree of Damages	Area (Ha)	Percentage
1	Destroyed	1.053 Ha	17.25 %
2	Major Damage	196 Ha	3.22 %
3	Moderate Damage	295 Ha	4.83 %
4	Un damage (in inundated)	740 Ha	12.13 %
5	Tsunami Inundated area	1.978 Ha	32.42 %
6	Un inundated area	1.840 Ha	30.15 %
	TOTAL BAC AREA	6.102 Ha	100 %

Source : JICA Study Team, 2005

Figure 3.1.1 Tsunami Damage Assessment Map



(3) Recommendation for BAC

It is imperative that Banda Aceh City be developed based on green city concept, because the principle of natural balance had been disrupted (destruction of mangrove forests, altered shoreline, lack of green space in the city). The disruption has been caused by man-made failures (such as building by disregarding prevailing legislations) as well as natural disasters (such as tsunami). The urban environment becomes flood-prone, vulnerable to full moon high-tide, micro-climate that becomes increasingly uncomfortable

(4) Green City Concept for BAC

Creating an urban environment that is resilient enough to restore the ecosystem itself, able to adapt to the growth of new urban life as an environmentally friendly city, and can protect the city from other natural forces (flood, sea wave, tidal influence, heat and wind)

(5) Green City Development Strategy for BAC

- Preserve existing open space and vegetation through conservation, rehabilitation, and revitalization of green city area and elements, to maintain environmental sustainability.
- Change public attitude and behavior in order to make them more aware and respectful to nature and environment.
- Provide urban facilities and infrastructures that support an environmentally friendly city.
- Control building density in order to guarantee the protection of water recharge areas and green areas.

(6) Banda Aceh Green City Development Plan

Banda Aceh Green City development plan is described in the following table.

Table 3.1.2 Banda Aceh Green City Development Plan

No	Banda Aceh Green City Development		Proposed Area Development
1	Conserve/protect coastal zones by achieving a synergy of land utilization in coastal areas, which support the economic, socio-cultural and nature/environmental sustainability aspects.		– Peukan Bada District (Aceh Besar Regency). – Meuraxa District: Ulee Lheu, Deah Glumpang, Deah Baro, Aloe Deah Tengoh, Lampaseh Aceh. – Kota Raja District: Gampong Pande, Gampong Jawa. – Kota Alam District: Lampulo, Lam Dingin, Bandar Baru, Lambaro Skep. – Syah Kuala District: Jelingke, Tibang, Deah Raya and Alue Naga.
2	Use of the on-going tidal embankment construction program, as a coastal road with economic, leisure and esthetic functions along the outer perimeter of coastal villages. Rest areas are proposed to be constructed in certain interval.		
3	Fishpond area development by planting mangrove in harmony with tidal fluctuation, sea wave, as well as nature conservation (habitat), green belt/buffer, economic and recreational area.		– Peukan Bada District (Aceh Besar Regency). – Meuraxa District: Ulee Lheue, Deah Glumpang, Deah Baro, Aloe Deah Tengoh, Lambung, Blang Oi, Lampaseh Aceh. – Kota Raja District: Gampong Pande, Gampong Jawa. – Kota Alam District: Lampulo, Lam Dingin, Bandar Baru, Lambaro Skep. – Syah Kuala District: Jelingke, Tibang, Deah Raya and Alue Naga.
4	Develop inner city ponds/retarding ponds (*situ*) as part of urban drainage system, which can also be functioned as urban green area, recreation area, public socio-economic area and urban aesthetics.		<u>Locations of retarding ponds (on-going city program)</u>: – Lambaro Skep (in Titi Panjang river mouth). – Lampulo (in Krueng Aceh riverside). – Lampaseh Aceh (in Krueng Doy riverside). – Asoe Nanggroe (in Krueng Neng river mouth).
5	Conduct urban greening in main urban skeletons (roads, rivers) and urban open spaces. It multi-functions as element of disaster mitigation in the form of escape routes and escape area, and protect the city against the effects of micro climate changes and create urban aesthetics.		
	A	Development of urban green elements along main urban roads, by maintaining existing vegetation and planting new hardwoods such as angsana, kepula trees, etc.	– Meulaboh – Malahayati access: Jl. Cut Nyak Dien, Kl. Tengku Umar, Jl. Sultan Alaidin, Jl. Muhamad Daud Beureuh, Jl. Tengku Nyak Arief, Jl. Laksamana Malahayati. – North – South access: Jl.Syiah Kuala, Jl. TH. GLP Payong, Jl. Hasan Dek, new road (from Simpang Surabaya to Jl. Sukarno Hatta). – Ring Road: Jl. Sukarno Hatta. – East – West Access: Jl. Iskandar Muda, Jl. Rama Setia, Jl. Habib Abdurahman, Jl. Tengku Cik Ditiro, Jl. Tengku Imum Lueng Bata, Jl. Tengku Iskandar, Jl. Tengku

No	Banda Aceh Green City Development		Proposed Area Development
			Nyak Makam. – Inner city: Jl. Panglima Polim, Jl. Tentera Pelajar, Jl. KH.Ahmad Dahlan.
	B	Development of urban green elements along river basin, by maintaining existing vegetation and planting new hardwoods such as angsana, kepula trees, etc	– Banjir Kanal Aceh. -- Krueng Daroy. – Krueng Aceh. -- Krueng Neng. – Krueng Doy. -- Lueng Paga.
	C	Development of urban green elements in urban public space, by maintaining existing vegetation and planting new hardwoods such as angsana, kepula trees, etc	– City park: Blang Padang, Darussalam Field, Brimob Field in Lingke, Taman Sari, KODAM field in Neusu. – Urban mosque's yards: Grand Mosque Baiturrahman field, Tengku Umar Mosque in Setui, Lampriet, Prada, Darussalam, Beurawe, Kuta Alam. – Open spaces in government offices and public & social facilities.
6	Enforcement of building codes regarding building coverage ratio, floor area ratio (BCR), floor area ratio (FAR) building distance (building setback and river setback)		All areas in Banda Aceh City.
7	Provision of garbage management facility (by Dinas Kebersihan dan Pertamanan Kota/DKP) which separate organic and non-organic garbage from household level to city level.		All residential, commercial and public facilities areas in Banda Aceh City, from neighborhood scale until city scale.
8	Provision of communal waste water treatment system for high density area in areas with low carrying capacity soil condition. Provision of a naturally safe and clean city waste treatment system.		All areas in Banda Aceh City especially in high density residential and commercial areas.
9	In the level of spatial planning, as far as possible avoid to allocate land for heavy/polluting industries in BAC.		All areas in Banda Aceh City.
10	Promote public understanding and community education to all citizens of BAC about the importance of nature and environmental protection through various media and forms of education (formal and informal education)		All areas in Banda Aceh City.

Source: Additional Study Team, 2006

Figure 3.1.2 Development of Banda Aceh Green City

Source : Additional Study Team, 2006

3.2 CYBER CITY CONCEPT

(1) Definition

Cyber City is a city that has been set according to public policy to empower its citizens, so that they can have access to the global information network, using public/private partnerships to achieve these goals; also called "community networks".

(2) Development Concept of Cyber City

- Gridlock

Such space restrictions necessitate the city exploit its non-physical assets. Thus, commerce that generates wealth but doesn't contribute to traffic or pollution is highly desired. Cyber city features can meet these needs.

- Social Equity Policy

The cities featured here viewed the Internet and its wealth of information as the new currency of the realm. Access to the goods, services, jobs and wealth which are available on the net are viewed as a basic right for residents, like any other legal right.

- Competitive Advantage

City increasingly views other cities as competitors for jobs and investment; attempt to entice investors to bring capital.

- Population Shifts

Across the globe, small towns are losing population to urban areas. To counteract this loss, some towns are investing in cyber-infrastructure as a way of both keeping jobs and keeping young people.

- Government Relations

Governments are increasingly called upon to justify their expenditures to voters. If "good government is good politics", then leaders who are viewed as visionary and bringing new services to constituents will be viewed favorably. City is using a WAN to communicate with residents, conduct business, promote commerce, reduce traffic, and increase efficiency.

(3) Vision

To transform Aceh into an IT driven economy.

Objectives:

- Upgrading the standard and quality of administration, particularly in social and public services sector through a process of modernization and rationalization of the administrative set up,
- Providing public centered, efficient and cost-effective Government,
- Extensive percolation of IT literacy and education in the City Government,
- Promoting investments in IT,
- Encouraging private sector initiative in IT related infrastructure and services,
- Increasing the share of IT in Local Government Gross Domestic Product,
- Generating IT related employment opportunities, and
- Enhancing earning capacity of the residents thereby ensuring a better quality of life.

(4) Policy and Public Domain

- Re-engineering of administrative processes
- IT Budget
- IT Initiative Fund for e-Governance
- City-wide Area Network
- Standardization of IT Infrastructure, Data and Applications

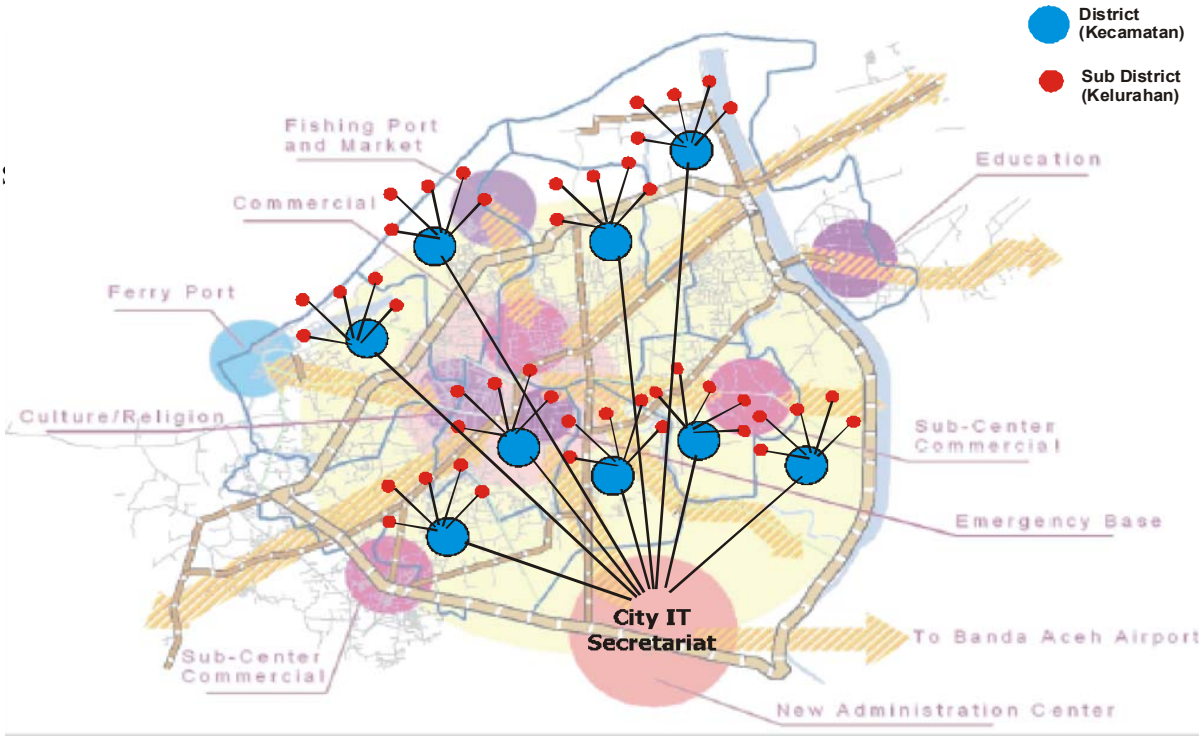
- GIS Technology
- Development of Portal Website
- IT Literacy in Government

(5) Development Strategy of Cyber City

- Universal citizen access (most important goal).
- Cooperative sharing of networking facilities between schools, libraries, hospitals and other government institutions.
- Improved government management and operation/improved citizen responsiveness.
- Improved workforce effectiveness through better education and training.
- Closer community/government/business relations through online access.
- Improved quality of life for residents (less gridlock, more communication) Extensive broadband infrastructure.

The major attraction of this scheme (Figure 3.3) is the provision of high quality infrastructure including high speed data communication links, local loops side-stepping the dependence on local telephone companies, ready to-use built up space with networking and backup power, uninterrupted power supply, and common services like photocopying, fax and security.

Figure 3.2.1 Schematic of BAC Area Network



3.3 TOURISM DEVELOPMENT CONCEPT

(1) Definition

Tourism Industry is a city that has tourism objects developed into the city attractive, and as parts of city society economical, social, and cultural activity.

Tourism objects themes
Natural tourism (*Eco Tourism, Water Tourism*), Educational and Spiritual Tourism, Historical Tourism, Tsunami Tourism), Village Tourism, and Shopping Tourism.

(2) Tourism existing condition in Banda Aceh city

BAC has been developed almost 1000 years old and has been developed the number of culture especially Eastern Culture (islands tropical). BAC has a potential to be develop as a living laboratory for Tsunami Disaster.
Existing problems:

- Destroyed tourism objects: absence of/lack of maintenance and tsunami effect.
- Neglected/ignored tourism objects, tourism object site usually pushed away by local housing.
- Lack of information and less attractive tourism site to be visited again.
- Poor access to the tourism sites.
- Lack of/less of tourism activity supportive infrastructure in the city.

Tourism potential:

- Old city tourism (*Historical Tourism*).
- A city with strong Moslem culture community (*Spiritual Tourism*).
- Tropical island natural environment (*Eco Tourism and Education Tourism*).
- The 21st Biggest Tsunami Victim City (tsunami tourism and education Tourism).
- Having correlation and accessibility with other tourism potential in Sabang city, Malahayati and Lhok Nga (Aceh Besar Agency).

Potential Tourism Spots

Several objects which potential to be developed as tourism object is described in Table 3.3.1

Table 3.3.1 Potential Tourism Spot in BAC

No	Potential Objects	Location	Description
1	Ulee-Lheue Mosque	Ulee Lheue	The only remaining building
2	PLTD power generating ship	Punge Balang Cut	Drifted to residential area
3	Mass Grave	Ulee Lheue	Burial of 15,000 tsunami victims
4	Fishery Boat Monument	Lampulo	Stranded on the roof
5	The big tree	Ulee Lheue	The only remaining tree
6	Stone Sculpture	Ulee Lheue	Tallest building around coastal area
7	Coastal Area	around Ulee Lheue bridge	Develop as Tsunami living museum
8	Coastal Area	around Ulee Lheue bridge	Develop as water recreation
9	Coastal Area	Along coastal line	Waterfront green park
10	Dutch cemetery	Center of BAC	Develop as historical burial park
11	Sultan Iskandar Muda cemetery	Center of BAC	
12	Princess Pool	Center of BAC	Develop as historical park

No	Potential Objects	Location	Description
13	Aceh Royal Palace (Pendopo)	Center of BAC	Develop as heritage park
14	Baiturahman Great Mosque	Center of BAC	
15	Islamic Sultanate Heritage	Gp. Pande	
15	Royal Burial heritage	Gp. Pande	
16	Syiah Kuala cemetery	Deah Raya	Can be develop as Historical Burial park
17	Old Peunayong city	Peunayong	Pecinan area/heritage area
18	Blang Padang	Center of BAC	Green city park
19	Taman Sari	Center of BAC	
20	Syah Kuala University park	Syiah Kuala	
21	BRIMOB park	Jelingke	
22	Cultural Exhibition	Lampriet	
23	Safiatudin Park	Lampriet	
24	Fish pond and river	Along coastal	Fishing area/ Water recreation
25	Market	Ulee Kareng	Can be develop as shopping/culinary tourism
26	Fish auction	Lampulo	
27	Rex Park	Peunayong	

Source : Additional Study Team, 2006

The location of all the above potential spots are shown in Figure 4.4.3

(3) Recommendation for BAC Urban Tourism

Banda Aceh city needs to be developed with Tourism Industry that integrate every existing tourism object over Banda Aceh area or the surrounding city (Sabang and Aceh Besar city), with the strict reference to the legal rules/qanun present.

(4) BAC Urban Tourism Concept

a. Improving accessibility to the tourism object site (using the existing road pattern or building the new one), the uncomplicated and integrated with the city system.

b. To create tourism site more representative in its object existence (characteristic value).

c. To create more accommodative Banda Aceh City environment for the tourist, and to prepare tourism supportive infrastructure to increase tourist's length of stay.

Figure 3.3.1 Location of Potential Spots Tourism Area

Source : Additional Study Team

(5) BAC Urban Tourism Development Plan

a. To develop Tourism Package (such as: Tsunami tourism, Historical Tourism, Spiritual Tourism (Islam), Education Tourism, Shoping Tourism), and Tourism track that link to other tourism site potential.

b. To develop Ulee Lheue area into one tourism spot that has vary tourism themes (historical tourism, coastal tourism, water tourism, tsunami tourism, city forest/park tourism, sport tourism).

c. To create Peunayong, Pasar Aceh, Lampulo, Nesu -Setui and Ulee Kareng area as shopping tourism area, and Banda Aceh Old City/China Town (Peunayong).

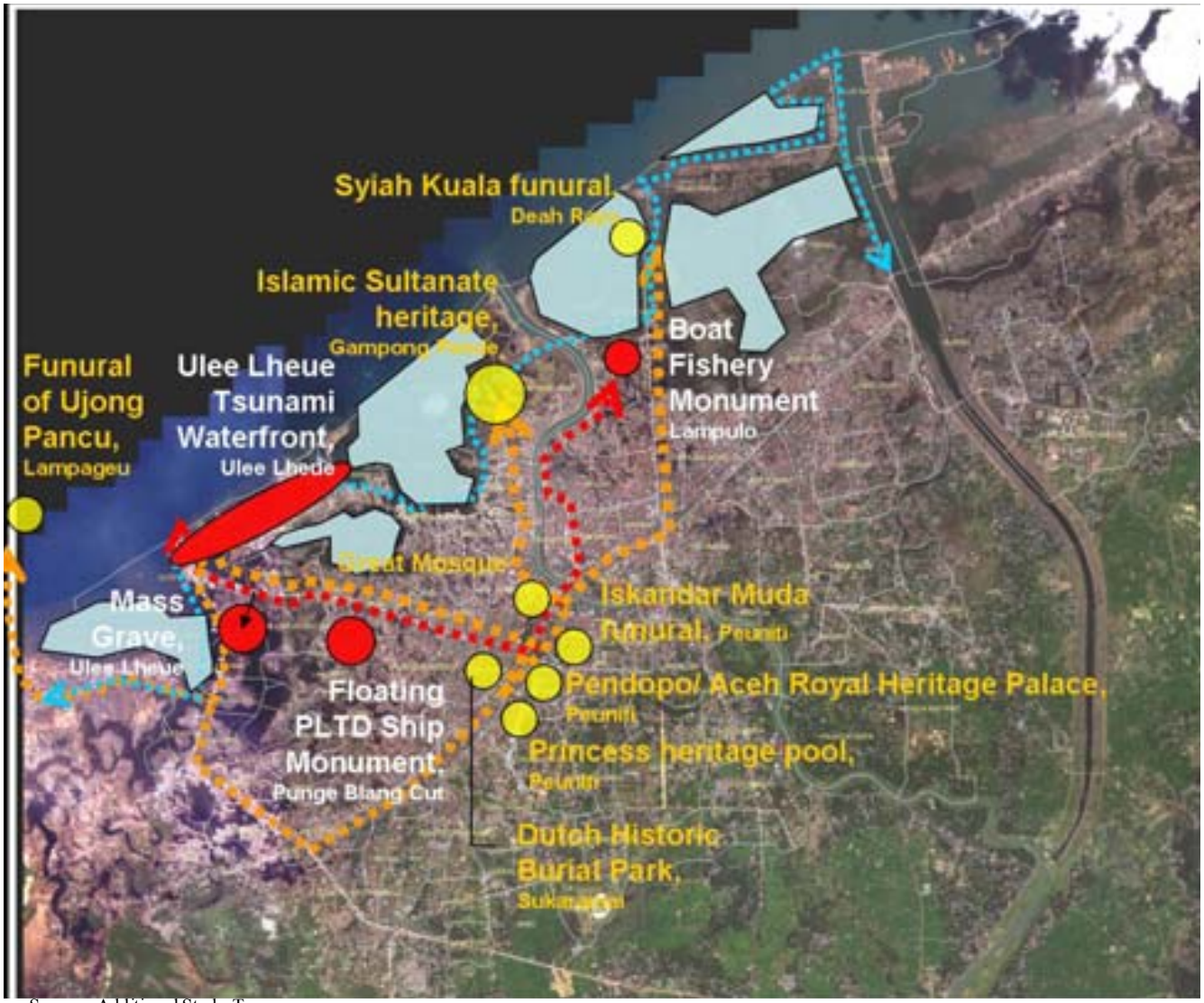
d. To develop the coastal area environment as natural tourism site (water tourism), and shopping tourism/restaurant (sea food, cottage, etc)

e. To develop all city open space area as the attractive public area for local community and tourist (domestic and foreign tourist).

f. To prepare the city street furniture (signs/symbol), information board, tourism information center started from the Banda Aceh city entrance and all the way to the tourism object site.

g. To supply supporting service facilities in Banda Aceh city (hotel, airport, transportation means and system

Figure 3.3.2 Tourism Package Development (1)



Source : Additional Study Team

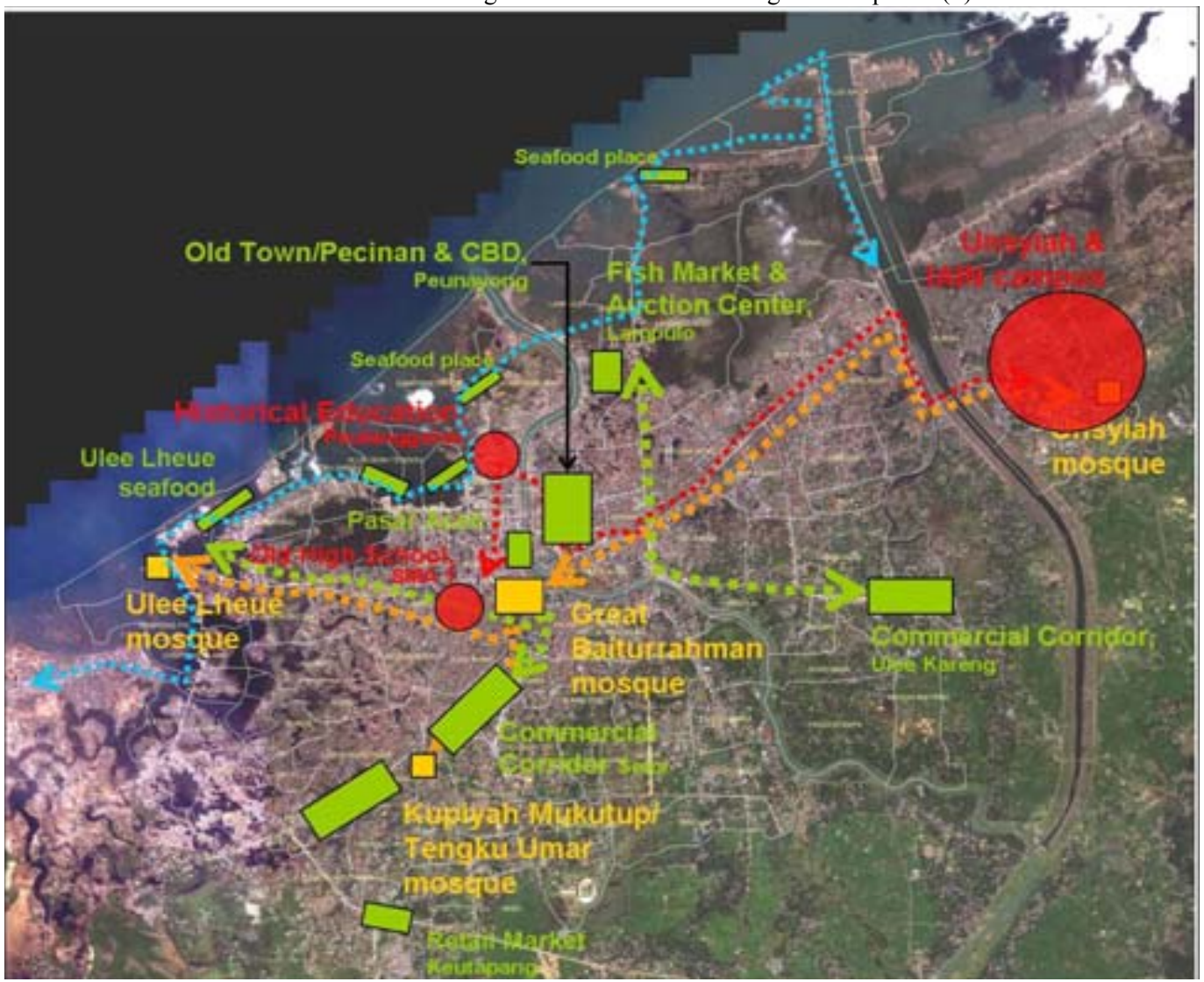
Package 1.
Ulee Lheue Water Tourism Development
-- Historical Tourism
-- Water Tourism
-- Green Park
-- Sport Facilities
-- Hotel & mix use

Package 2.
Tsunami Tourism Package & Route Development.
-- Ulee Area
-- Mass Grave
-- Floating PLTD Ship
-- Boat Fishery

Package 3.
Historical Package & Route Development
-- Gampong Pande
-- Pendopo
-- Ulee Lheue
-- Lampage

Package 4.
Waterfront/Eco Tourism Package & Route Development
from Peukan Bada to Alu Naga

Figure 3.3.3 Tourism Package Development (2)



Package 4
Islamic Spiritual Tourism Development
-- all big mosque

Package 5.
Commercial Tourism Development.
-- Peunayong
-- Pasar Aceh
-- Ule Kareng
-- Lampulo
-- Nesui, Setui
-- Ketapang
-- Ulee Lheue
-- Along the coastal line

Package 6.
Education Tourism Development.
-- Peulanggahan
-- Syah Kuala
-- IAIN Ar Raniry
-- Old High School
-- Alam lingkungan

Source : Additional Study Team

3.4 INDUSTRIAL DEVELOPMENT CONCEPT

(1) Definition

Industrial Development Concept is a concept that put industrial activities as the city main base, by processing every available city natural and human resources. Factors that support those industrial activities are human labor (quantity and quality), accessibility, available material, technology, social condition, economy, cultural and environment

(2) Existing Conditions

There has been no rooted industrial activity within present administrative area of BAC. BAC has a long history as a port city (transit city) and its people are famous for their trading skills.

Big industry and heavy polluted industry is not recommended in Banda Aceh, because:

- Banda Aceh city is not planned as industrial city, it is shown in the previous spatial plan, that did not include industrial zone inside Banda Aceh city area.
- There are no basic material/nature resources for big industry and heavy polluted industry in Banda Aceh city
- Banda Aceh city developed with the Green City approach, it is demanded to avoid any environment unfriendly activity/allocation

(3) Recommendation for BAC Industrial Development

Banda Aceh City is not recommend to be developed as an heavy industrial city especially for polluted industry. BAC will be developed as industrial zone which maximize the use of abundant labor force and natural resources and environmentally friendly.

Industrial activity should be best developed in areas away from urban and residential areas. Ideally it should be located in close proximity to Malahayati Sea Harbor to facilitate the hauling of cargo to other areas by ocean liner, and around Lhoknga that have been develop (before tsunami) as a big cement industry PT. Semen Andalas Indonesia (PT.SAI).

The development of industrial zone is linked to metropolitan development plan and land use metropolis.

For the laborers working in industrial zone, it is preferable to provide housing facilities for the sake of welfare of the laborers.

3.5 NON POLLUTED, MASS TRANSPORT CONCEPT

a. Behind the idea

Under the metropolitan city scenario, BAC will serve both internal and external movements. Internal movement will generate from the local people activities and flow both inside BAC or outside BAC. External movements come from external people who work, visit or live temporary in BAC. The combination of both will trigger BAC more crowded in the future.

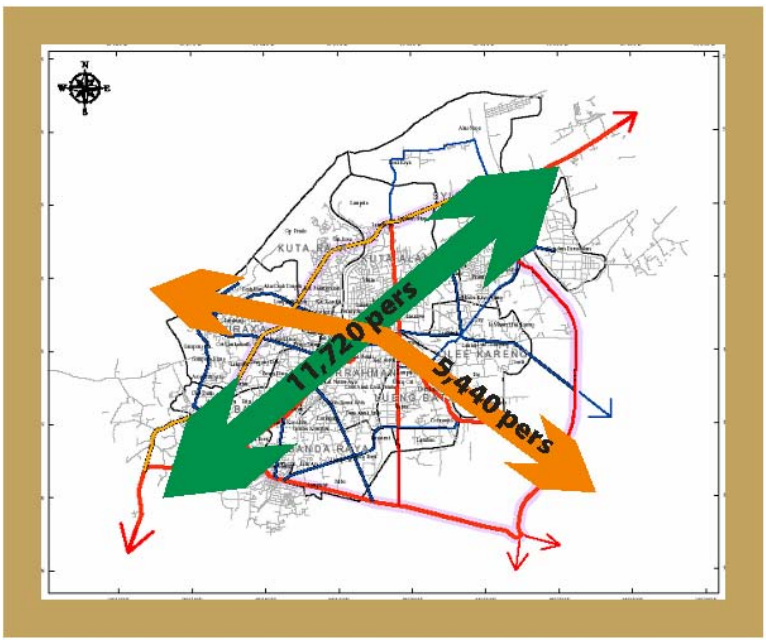
Unfortunately, there is no record data on trips a day for BAC and its adjacent areas. However, according to other cities in Indonesia, the trips generated a day by people will usually vary from 30% to 50% of the city's total population (JMTSS, 1990). In the same case, with total population 263.668 person in 2005, BAC will expectedly generate about 120.000 trips a day. Those trips will join with ones coming from the adjacent areas, potentially reaching to 90.000 trips a day.

Assume that each person who makes trip will use a private car—because of the absence of public transport service. A day, approximate to 200 thousand cars trip will bomb BAC simultaneously, resulting in acute congestion along the road network inside the city. And imagine, how many pollutants will come into the air and caused the magnification of dangerous materials in it.

Therefore, the idea of implementation the mass and non-polluted transportation meet the issue of how creating a urban transportation which complies with the demand to provide a safe and efficient transportation operation. The mass transportation itself refers to the concept of how transporting people in large scale of quantity simultaneously, therefore, it is efficient. The non-polluted transportation concept will conform to the issues of environmental conservation.

In the future, the implementation of mass and non-polluted transportation will:

- Provide BAC with a system for transportation that can encourage the urban movement point to point in effective and efficient level
- Ease people paying transportation cost in affordable price, comparing to cost for the use of private car
- Alleviate traffic congestion across the BAC
- Reduce air pollution which transportation comes to one of its main contributor



b. BAC LRT System

1) Proposed LRT Routes

According to the road network pattern, it is recommended that routes for LRT

application will be proposed as follows:

Corridor 1

Corridor 1 will delineate along the main arterial road in the BAC town. It connects the south west to north east of BAC, serving journey by people along the road.

With the total route length reaching approximately 8 km, the corridor will be equipped at least 16 shelters, with 500 m space between shelters. Each shelter will locate at any cross line between the trunk routes and the feeder ones.

Corridor 2

Corridor 2 connects the one of vital transportation node the Ulee Lheue Harbour and the south east of BAC. Conceptually, citizens whose destination is to either the Ulee Lheue Harbour or areas along the line the corridor 1 will serve.

In future implementation, with the total length approximately 9.0 km, the corridor 2 will be equipped with at least 18 shelters, if the space between two shelters is every 500 m. Each shelter will collect prospective passengers come from the surrounding areas or from the feeder service with end route at any cross between the corridor 2 service and the feeder services.

Figure 3.5.1 Corridor 1 LRT line

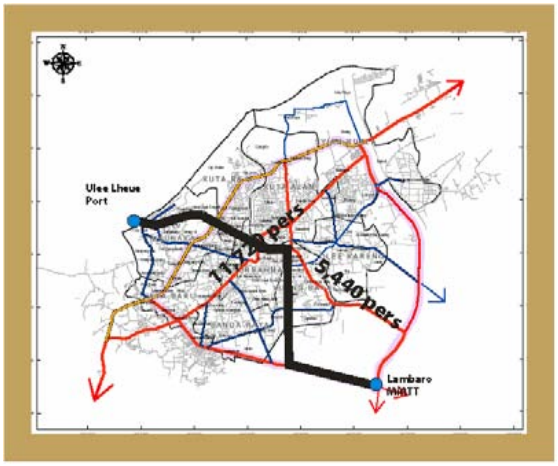
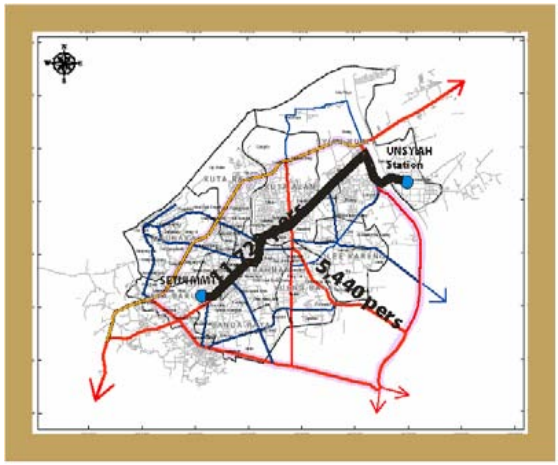


Figure 3.5.2 Corridor 2 LRT line



2) Proposed LRT Types

Implementing the LRT will quietly depend on the passenger demand rate and the load capacity of the LRT itself. There are two types of the LRT in accordance with its capacity especially its line capacity, i.e. LRT Type 1 and LRT Type 2. The main difference of both types of LRT is a right of way the LRT will use. The LRT Type 1 will use a right of way that remains open by road traffic intervention, while the LRT Type 2 will use that of one without road traffic intervention.

Because of the presence the intervention by road traffic, the LRT 1 will logically have less line capacity than the LRT 2, since the line capacity is dependent on the flow rate of the LRT a day. Shortly,

the intervention by road traffic will lengthen the LRT travel time along the line, subsequently causing the more headway needed by the first vehicle and its consecutive vehicle.

Even though, the LRT 1 has lower line capacity, its construction cost is presumed cheaper, since the track is shareable with road traffic, so the new structure provision can be avoided.

The LRT 1 will quietly be applicable for BAC in reason it gives space to urban development in the future that is more flexible.

3) Proposed Power Supply

LRT is commonly powered by electricity ranging from 700 to 1500 KV. The power demand could be supplied by a new power plant or can utilize the existing one if it is presumed sufficient enough in capacity as it shares with community uses.

4) Track and Road Sharing

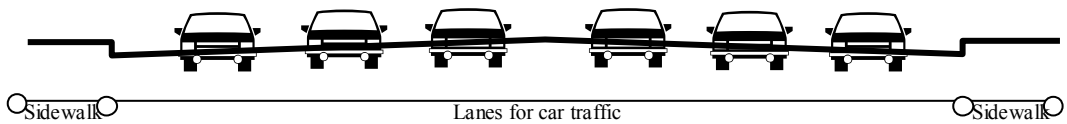
As previously has been exposed, the LRT 1 is dedicated to use track that can utilize some space of the existing road. To alleviate traffic congestion resulting in the narrowing of the road space for non train traffic, it is recommended to apply traffic demand management following the supply management that will be implemented. Out of such a problem, the space sharing between LRT track and road will remain applicable under some assumptions previously presented.

Some justifications below should follow any strategy will apply to the space sharing method. Space sharing will only apply for roads with at least 3 lanes and or 9.0 meters in width.

At which a bridge presents, the LRT track must not share width with road alignment. The track preferably uses an independence bridge. It will be unavailable if the bridge width exceeds 9.0 meters.

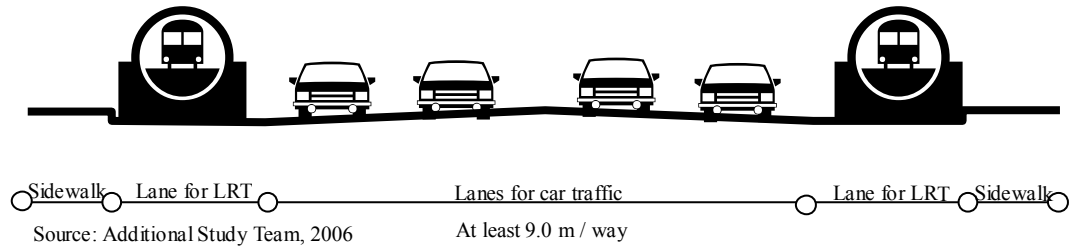
Afterward, the proposed strategy will be as depicted in Figure 4.3.5 and 4.3.6.

Figure 3.5.3 Road lanes utilization before LRT introduction



Source: Additional Study Team, 2006

Figure 3.5.4 Road and track sharing after introducing the LRT



Source: Additional Study Team, 2006

4) Headway Adjusment

Because of the normal headway will cause low load factor for MRT, it is necessary to set headway in appropriate value so the proposed MRT operation will be effective as well as efficient.

Table 4.3.7 shows the results of headway adjusment to meet the operational planning in 2015 in accordance with the prospective passenger demand. The result indicates that the lower headway seems to be economically feasible and producing some benefits. Passengers will benefit from the more choices any hour they want to access the MRT and from the minimum waiting time in station or transfer point they will spend. Operators will benefit from the total passenger they transmit a day proportional to the cost a day they have to pay for the investment value.

Table 3.5.5 Adjusted headway following the passenger demand in 2015

Description	Vehicle Capacity (pass)	Adjusted Headway (minutes)		
		Line 1	Line 2	Line 3
Light Rail Transit I	450	37.3	143.2	94.5
Light Rail Transit II	900	74.6	286.4	189.1

Source: Additional Study Team, 2006

3.6 DISASTER PREPAREDNESS

a. Hazard Potential

Some of hazard potential in Ache Besar comes from two main types of disaster: Earthquake and tsunami. The main source of earthquake is from the dynamic activity of seabed at the Indonesia Sea. According to the Seismology Office in Indonesia, the earthquake activity record in Indonesia seabed generates in each 2 years, which the largest value periodically occurred in 25-100 years.

Earthquake disaster commonly caused damage in a horizontal direction. It means that the power to destroy streams horizontally from the center of generation then spread out to any direction the power can sustain. Therefore, the effect caused by the earthquake commonly in a form of lateral damages such as earth cracks, structures collapses, land subsidence, etc. The damage treats people in a way of excessive impacts such as collapsed parts of building can fall onto people, making died or injures.

Tsunami was the post disaster to the earthquake, as it generates after the earthquake shock. The last tsunami occurred in Aceh was preliminary begun with the 6.8 earthquake in Richter scale which epi-center is located at the meeting line of Continental plate from the pacific sea and south plate from the Indonesia sea.

Tsunami commonly causes large damages to the area close to the shoreline in direction both lateral and vertical. The recorded tsunami occurred in the world, the last tsunami in Aceh was the third largest in the world. It caused more than 70,000 casualties with a half of those died and the remains suffered

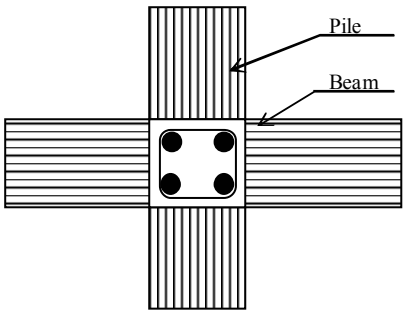
from injures. It also caused large devastated area along the shoreline, resulting in thousand people to be dislocated and became refugees.

b. Preparedness against disaster

1) Structure selection techniques against earthquake

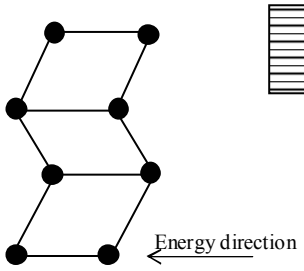
The earthquake shock caused the structures damage in many existing infrastructures such as roads, building, bridges, etc. The structures commonly experience damage in various levels depending on their capabilities in responding the earthquake periodically shocks. Therefore, in responding the earthquake caused damage, all structures within the disaster potential region must equip themselves with tools that can absorb the earthquake power so they could sustain when the earthquake occurs.

Some of techniques vastly used in structures designs against earthquake shock are as follows:



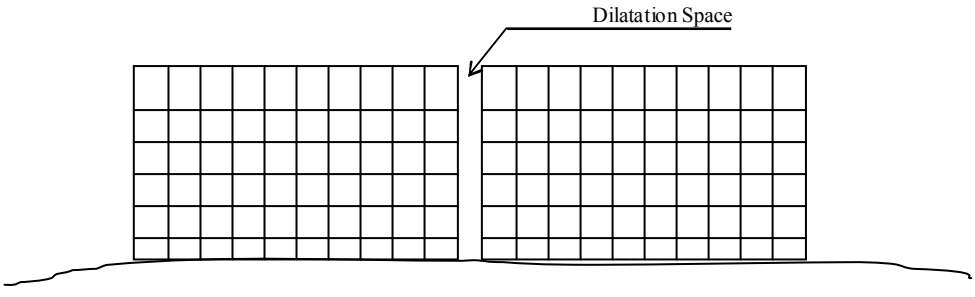
- Structures with rigid frames

  Structures with rigid frames proved stronger in fighting against earthquake. The rigid frame structures made of piles and beams that connecting and composing each other The ties must stronger than the energy proportional to time.



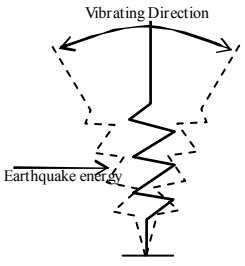
- Structures with dilatation

  Earthquake shocks buildings in lateral direction, so to reduce the impacts the building must apply the dilatation. As a guideline, for every building with 50 m in length can apply 1 m or more space dilatation. The purpose of the application of dilatation is to give space for building vibration in horizontal direction. As the building can vibrate in enough distance, it can sustain from the earthquake impact.



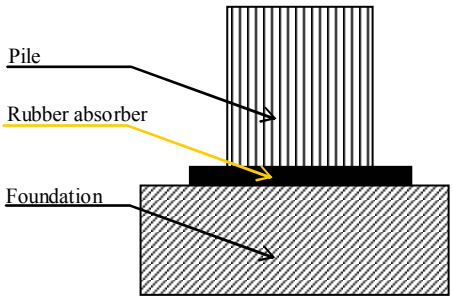
- Structures with spring concept

  As previously mentioned, earthquake will affect the building from the horizontal direction. Therefore, the damages caused by it will flow from the sub structures up to the upper structures. Therefore, the application of the spring concept in the sub structures could minimize the shocks



energy generated by earthquake. The spring works in way of allowing the structures to respond the energy sent by the earthquake by moving itself in a reverse direction periodically and stopping when the energy action halted.

- Structures with slight mass



Structures made of wood have proven more responsible to the earthquake shock than that of other materials. Thus, in areas with high liquefaction are preferable to apply wood structures than concrete ones. Wood structures, as its mass is slight and its upper structure is not monolite with sub structures, have higher flexibility in responding the lateral energy generated by the earthquake than concrete. Even, wood structures, with accurate design, can sustain in earthquake with 6.0 in Richter scale.

2) Facilities against Tsunami

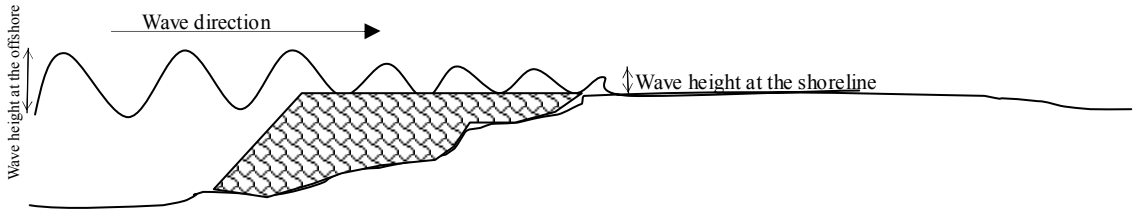
For purpose of fighting tsunami and reducing its impacts to people or infrastructures in the area close to the shoreline, some types of building must be prepared in the surrounding shoreline. Many buildings play in various roles depending on the type of building and its usage purpose.

- Breakwater

There are two types of breakwaters that can be used to fight against tsunami and or to reduce the tsunami impacts, namely, a normal breakwater and detached breakwater. A normal breakwater is a breakwater (or breakwaters) that its form is long perpendicular to the shoreline toward the sea. The detached breakwater is a breakwater that its form is long parallel to the shoreline, forming like as fences or water dike.

A detached breakwater is more effective in reducing the tsunami wave height-and-speed as it fights tsunami at the lateral position, while, a normal breakwater fights against tsunami in a way of breaking the tsunami wave in longitudinal direction.

Figure 3.6.1 Detached Breakwater



Source: JICA Study Team, 2005

- Embankment

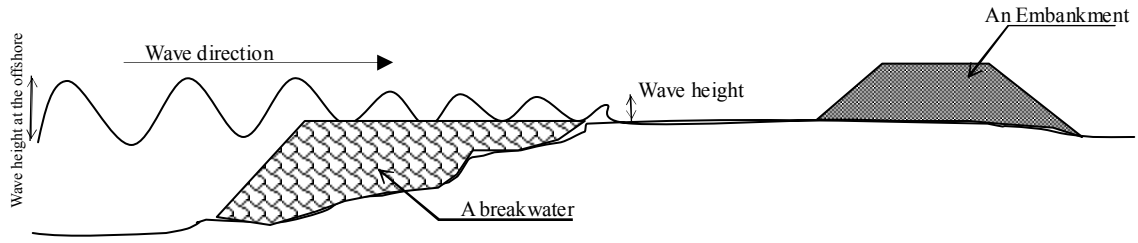
- Embankment

An embankment plays a role of preventing water after passing the breakwater so it is going to infiltrate the area in the inner side of the embankment. However, the embankment can also be prepared as the second line of breakwater as its form is possible to break the water passing it.

The existence of the embankment is important enough as the breakwater can never prevent water a whole. The presence of the embankment, thus, can help stopping the running water toward the shore areas.

The form of embankment itself is like that of the detached breakwater. The main difference is in embankment physic is not cut off space as that of presence in the breakwater. Those are situated in the shoreline parallel to the line direction of the shore. Because of each function, the breakwater location is prior to the position of the embankment.

Figure 3.6.2 Embankment



Source: JICA Study Team, 2005

The real embankment can be a coastal road or an independent water dike. The form of a coastal road is valuable because of it acts two function in the same time.

- Plantation on Coast

Plant is a natural material that can effectively be used as the barrier against tsunami danger. If presented on coast, plant can reduce the speed of tsunami wave and prevents land clearing from the tsunami activities. The area can also benefit from the greening process by which the air surrounding the area can keep fresh and less pollutant.

- Tidal Gate

A tidal gate will block tsunami wave when it flows through a water tunnel or a river, so it cannot pass the river or pass but with slow speed and low wave. The presence of tidal gate can be very helpful especially for preventing the area on the surrounding of the riverbank.

In future, all rivers have to be equipped with the tidal gate. All tidal gates should be preferable equipped with automatic control for closing and opening gate without manual intervention. Automatic control can ensure high reliability and work performance during operational.

c. Emergency Management Plan

Emergency is briefly defined as a sudden and usually unforeseen event that requires immediate action to minimize consequences. Emergencies may be routine adverse events that do not have community-wide impact or do not require extraordinary use of resources or procedures to bring conditions back to normal (also referred to as a critical incident).

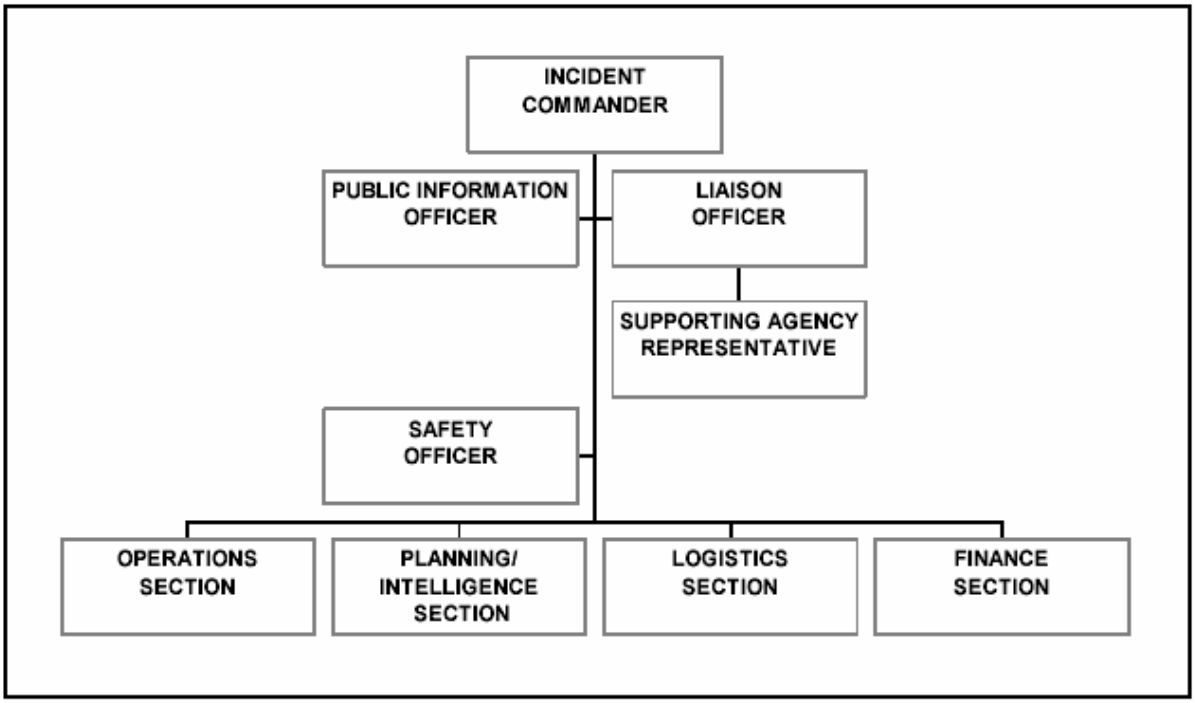
Resoluting emergency condition during disaster will need many efforts and program that can be very complicated. Emergency preparedness, emergency handling, and emergency recovery will be the procedures standard that must exists as the part of emergency planning. Thus, all procedures have to be managed in order to make system effective and efficient. Thus effort called as emergency management.

c.1. Establishing staff structures

Establishing special agency for handling mitigation during emergency condition is a vital program. The presence of special Agency in BAC will have to responsible any disaster happen, so the mitigation process can works on time and accurate.

The proposed agency staff structure is as shown in Figure 4.3.9. The governor of Aceh province or the regent of BAC can act as the incident commander. The following staff can be filled by proper persons which are taken from either governmental officer or independent worker.

Figure 3.6.3 Staff Structure of Special Agency for Emergency Condition



Source: Source: Additional Study Team, 2006

c.2. Preparing program

The special agency is responsible to propose some programs relating with disaster mitigation. One of important program is an action plan program. Following the international standard, an action plan program can consist of such below:

- *Identifying Hazard Potential*
- *Identifying Hazard Resolution*

Figure 4.3.10 provides an example of a matrix for mitigating hazards based on frequency of occurrence and severity. This matrix condenses risk resolution into a table, and prioritizes the risks that are evaluated. The matrix presents severity ranging from I (most severe) to IV (least severe) and probability of occurrence ranging from A (frequent) to E (improbable). From this matrix, four categories can be assigned:

- Unacceptable (IA, IIA, IIIA, IB, IIB, IC)
- Undesirable--allowable with agreement from management staff (IIIB, IIC, ID)
- Acceptable with notification of management staff (IVA, IVB, IIIC, IID, IIID, IE, IIE)
- Acceptable (IVC, IVD, IIIE, IVE)

Figure 3.6.4 Hazard Resolution Matrix

	I. Catastrophic	II. Critical	III. Marginal	IV. Negligible
A. Frequent	Unacceptable	Unacceptable	Unacceptable	Acceptable/WR*
B. Probable	Unacceptable	Unacceptable	Undesirable	Acceptable/WR*
C. Occasional	Unacceptable	Undesirable	Undesirable	Acceptable
D. Remote	Undesirable	Undesirable	Acceptable/WR*	Acceptable
E. Improbable	Acceptable/WR*	Acceptable/WR*	Acceptable/WR*	Acceptable

*Acceptable/WR -- Acceptable with review by management staff

Source: Source: Additional Study Team, 2006

The options for resolving hazards in order of decreasing desirability are:

- Design the system to eliminate the problem

- Design the system to control the problem
- Add safety or security devices to control the problem
- Add warning devices to control the problem
- Institute special procedures or training to control the problem.

c.3. Preparing Facilities

Some facilities that are commonly used for mitigation purposes are as presented in Table.

Table 3.6.5 List of Emergency Facilities

No.		Equipments	Notes
I Earthquake			
1.	Control Devices	• Mini seismic detector • Comprehensive seismic detector	• Installed in any household, able to detect seismic activities in moderate accuracy, low price, easy to install, less maintenance. • Installed in central office, able to detect seismic activities in high accuracy, high price, require a trained man to operate.
2.	Warning Devices	• Loud Speaker • Alarm	• It is used by officer in each village to inform people concerning with a disaster, order them to gather in the save place as educated. • It is used to warn people with disaster events. People sometimes will be aware of what just happen by alarm then by other warning equipments usage.
3.	Evacuation Equipments	• Vehicle • First Aid Equipments (FAE)	• It is utilized to load people running away from the dangers area to the safer places. It is also used to transport people with injured to the emergency base for next treatment. • They are utilized to facilitate people getting first aid during they get injures.
II Tsunami			
1.	Control Devices	• Seismic detector • Tsunami detector	
2.	Warning Devices	• Loud Speaker • Alarm	• It is used by officer in each village to inform people concerning with a disaster, order them to gather in the save place as educated. • It is used to warn people with disaster events. People sometimes will be aware of what just happen by alarm then by other warning equipments usage.
3.	Evacuation Equipments	• Vehicle • First Aid Equipments (FAE) • Road • Building	• It is utilized to load people running away from the dangers area to the safer places. It is also used to transport people with injured to the emergency base for next treatment. • They are utilized to facilitate people getting first aid during they get injures. • Escape road and relief road common exist • Escape building common exist

Source: Additional Study Team, 2006