

## **Transboundary watershed management: A case study of upstream-downstream relationships in Ciliwung watershed**

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### **INTRODUCTION**

Ciliwung watershed is an interesting watershed in term of size, position, and the governments involved in its management. The size of Ciliwung watershed is not so big, it covers the area of about 387 km<sup>2</sup>, with the main river length of about 117 km. The river flows into the middle part of Jakarta, the capitol of the Republic of Indonesia, and involve 1 district and 5 municipalities (Bogor District, Bogor, Depok, South, Center), and North Jakarta municipalities of two provinces (West Java and Jakarta Governments). Bogor district area mostly covers the upper part of watershed, and small part of it together with Depok Municipality area covers the middle part, and the municipals of Jakarta cover the downstream of watershed.

The rivers flow to Jakarta area actually is not only Ciliwung river, but there are some rivers, but the influence of Ciliwung river and its man made canal (west canal) into the Jakarta region is the biggest among the rivers flow to Jakarta (Figure 1). Therefore, the occurrence of flood in Jakarta is always related to Ciliwung watershed management, especially in the upper part.

Since the implementation of decentralized government system, where the smallest level of autonomous government is district level, then the management of watershed that covers more than one district become more complicated.

This paper presents the figure the Ciliwung watershed and its management during decentralized government system. Transboundary in this context means inter-district governmental management.

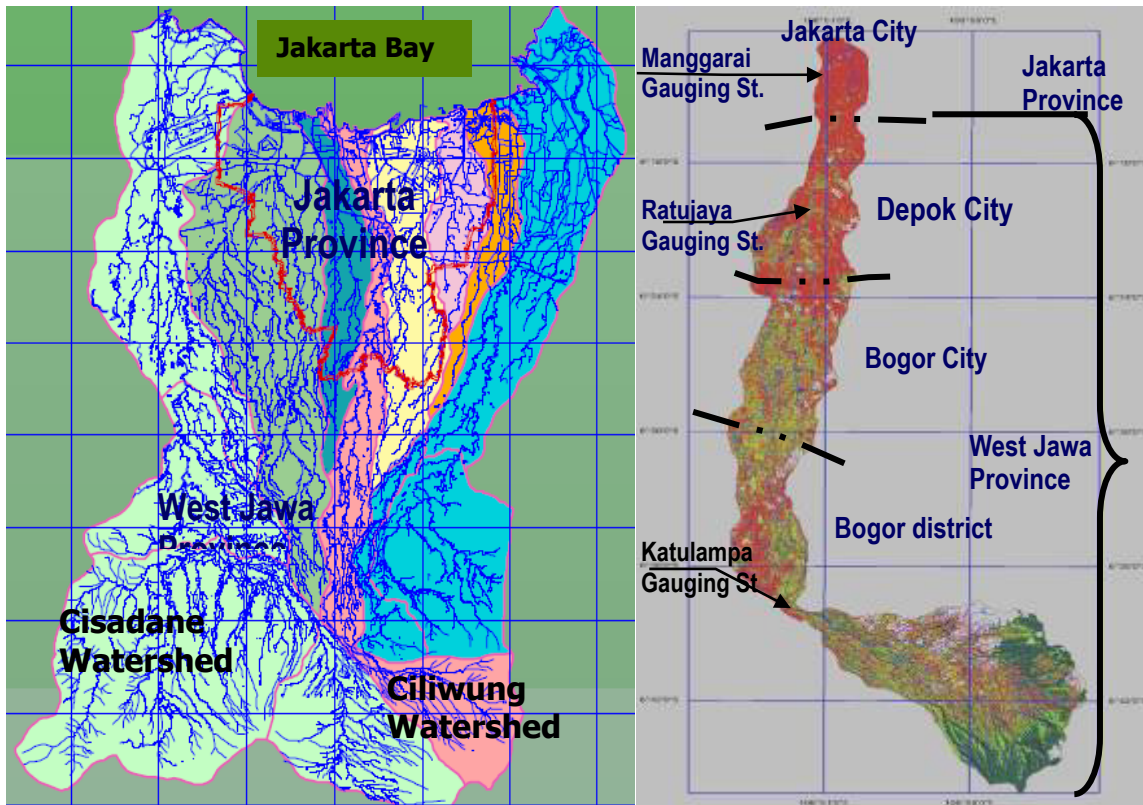
### **CILIWUNG WATERSHED AND ITS MANAGEMENT**

The upper watershed that is upper area of Katulampa Dam/Gauging station covers the area of about 146 km<sup>2</sup>. This area is mountainous area. Located at 300 – 3.000 m a.s.l. The slopes steepness of 2-15% covers the area of 70.5 km<sup>2</sup>, 15-45% (52.9 km<sup>2</sup>), and the rest is > 45%. The average annual rainfall of the period of 1989-2001 was 3,636 mm. There are many springs found in this upper watershed. The maximum discharge at Katulampa tend to increase, while the minimum discharge tend to decrease by year (Figure 2).

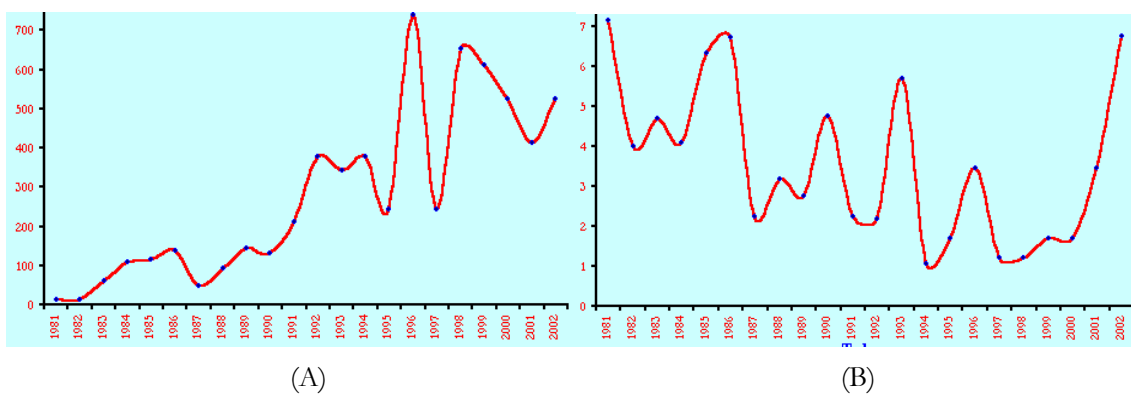
Based on Regional Land Use Planning of West Java Province 2010, this upper watershed is designed for conservation, agro industrial and agro tourism development through community empowerment.

The objective of this area development is to maintain the conservation function for sustainable water supply and flood control of downstream. To achieve this objective,

the President decree (Keppres) No. 114/1999 was issued and state that until the year 2014 the 84% of this area must be functioned as the recharge area, and only 16% for business area (city development).



**Fig. 1** The position of Ciliwung watershed among District/Municipality regions.



**Fig. 2** Maximum (A) and minimum (B) discharge fluctuation (1981-2002).

The middle part of the watershed that is the area between Katulampa and Ratujaaya Gauging Station at Depok City covers the area of about 94 km<sup>2</sup>. This area is located at 100-300 m a.s.l. and dominated by the slope steepness of < 15%. The average annual rainfall is 3,910 mm.

The downstream that is the area from Ratujaaya to Manggarai gauging station

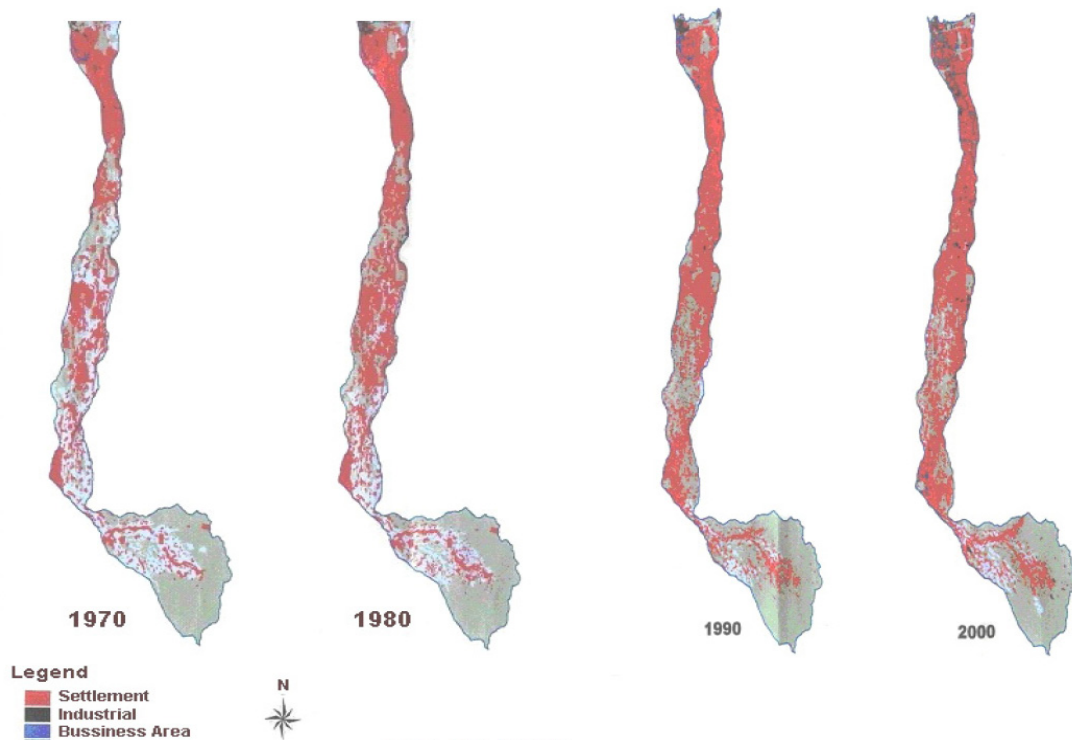
covers the area of about 82 km<sup>2</sup>. This area is dominated by flat area of < 2% slope steepness, and located at < 100 m a.s.l. The average annual rainfall is 2,126 mm.

The economic development of Jakarta, Depok, Bogor and other cities around Jakarta causes rapid change of land use from the green-vegetative areas to developed-buildings areas in Ciliwung watershed (Table 1 and Figure 3).

**Table 1** Land use changes in Ciliwung watershed, 1970-2000.

Land Uses	1970		1980		1990		2000	
	Ha	%	Ha	%	Ha	%	Ha	%
<b>Green and pen Areas</b>	<b>25.687,99</b>	<b>66,35</b>	<b>22.474,57</b>	<b>58,05</b>	<b>18.289,38</b>	<b>47,24</b>	<b>15.079,84</b>	<b>38,95</b>
Agriculture and other green covers	15.312,13	39,55	13.817,70	35,69	13.066,61	33,75	10.478,55	27,07
Wet land and water body	10.375,86	26,80	8.656,87	22,36	5.222,77	13,49	4.601,29	11,88
<b>Developed area</b>	<b>13.027,90</b>	<b>33,65</b>	<b>16.241,31</b>	<b>41,95</b>	<b>20.426,50</b>	<b>52,76</b>	<b>23.636,04</b>	<b>61,05</b>
Housing	12.060,00	31,15	12.385,21	31,99	13.984,18	36,12	14.410,05	37,22
Industry	193,58	0,50	1.711,24	4,42	2.470,07	6,38	3.883,20	10,03
Business area	774,32	2,00	2.144,86	5,54	3.972,25	10,26	5.342,79	13,80
<b>Total</b>	<b>38.715,89</b>	<b>100,00</b>	<b>38.715,89</b>	<b>100,00</b>	<b>38.715,89</b>	<b>100,00</b>	<b>38.715,89</b>	<b>100,00</b>

Source: Melati F.F., Hendrawan, D. and Sitawati, A.



**Fig. 3** Distribution of land use change in Ciliwung watershed, 1970-2000 (Melati F.F., Hendrawan, D. and Sitawati, A.).

Decreasing function of Ciliwung watershed indicated by land use changes from open green space to develop space with worse drainage system, frequent occurrence of flood and increasing of flood influenced area is the indicator of unsuccessful of watershed management which is also related to watershed governance. The (national) government and provincial government policies of land use of upper watershed are not strong enough to drive better land management activities in the upper watershed of Ciliwung.

### **CONCLUDING REMARKS**

The weakness of coordination institution in watershed management is a problem that needed to be solved. The Provincial Development Planning Board (BAPPEDA) is hoped to be a coordination institution between or among districts/municipalities in regional development planning based on watershed development principles, but in fact the provincial-regional planning and watershed development planning are still two different planning, and also mostly the district-regional planning are less as an integrated provincial planning.

The weakness of coordination institution cause the districts/municipalities fail to formulate the cost-benefit sharing as an incentive system for environmental based development. As we know the environmental (economic long term) based development need more finance than the short term economic development. Consequently, the districts-regional development tends to be focused on short term economic development. The development of upper Ciliwung watershed is still far from the agro business and tourism development. The housing and settlement development is still dominant.

Driving factor for environmental development in upper watershed management as the water recharge for water supply to downstream should be created as an incentive system and initiated by related districts/municipalities or provincial province. In this case, Bogor, Depok districts/municipalities, West Java and Jakarta Provinces. The one success examples of this collaboration is collaboration of Kuningan District and Cirebon Municipality in upper watershed development, where Cirebon Municipalities Government agree to pay a certain amount of money to Kuningan District Government for upper watershed development to supply water to Cirebon Municipality.

Multi stakeholders processes to build the inter governments commitment among Bogor district, Bogor, Depok and Jakarta Municipalities have been done several times through Watershed Management Forum, but those are still ineffective. Watershed Management Forum is loose coordination institution. To increase the effectiveness of the communication process, the mandatory coordination institution should be developed.

### **REFERENCES**

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