River flood damage estimation in Jakarta, Indonesia

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Background

✓ Flooding is a serious problem in Jakarta.

✓ Estimation of flood damages is important to estimate the benefits of implementing flood protection measures.

Objectives

1) To estimate the actual flood damages by means of a survey,

2) To study the relation between flood damage and flood characteristics,

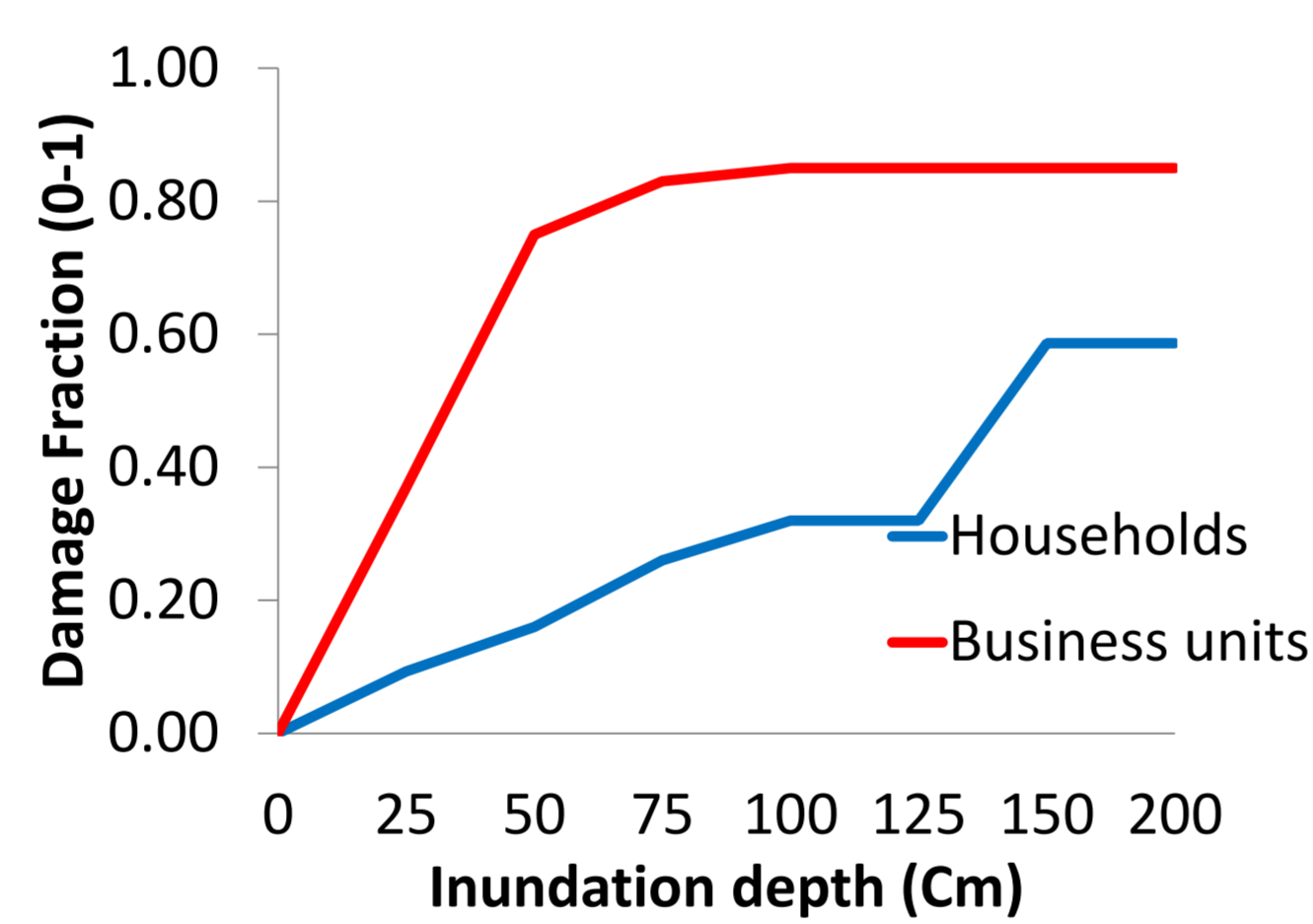3) To compare the actual damages to those obtained by means of expert assessment in a GIS analysis.

Results

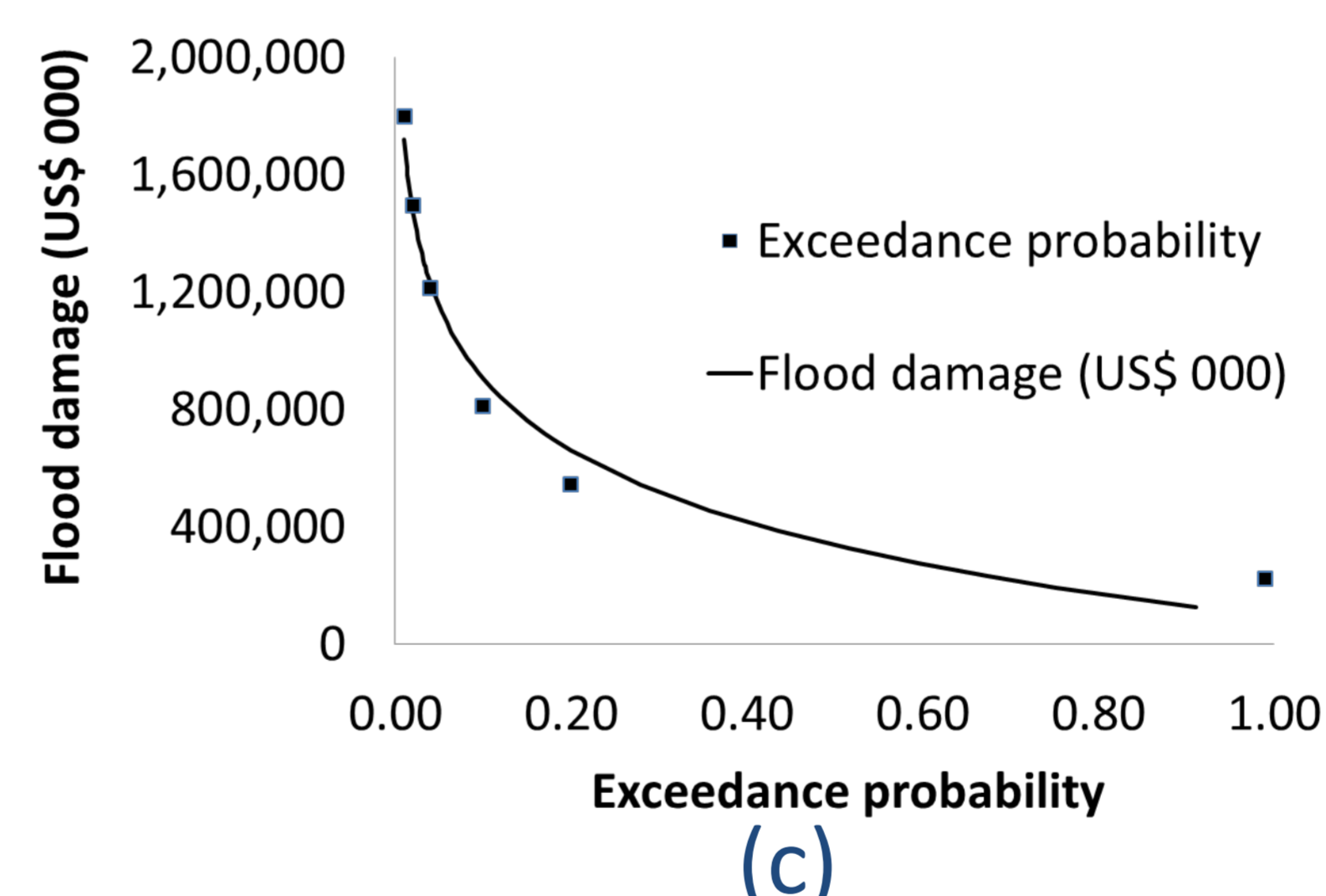Table 1. Estimated damage from flood in January 2013 by survey and expert-GIS approaches

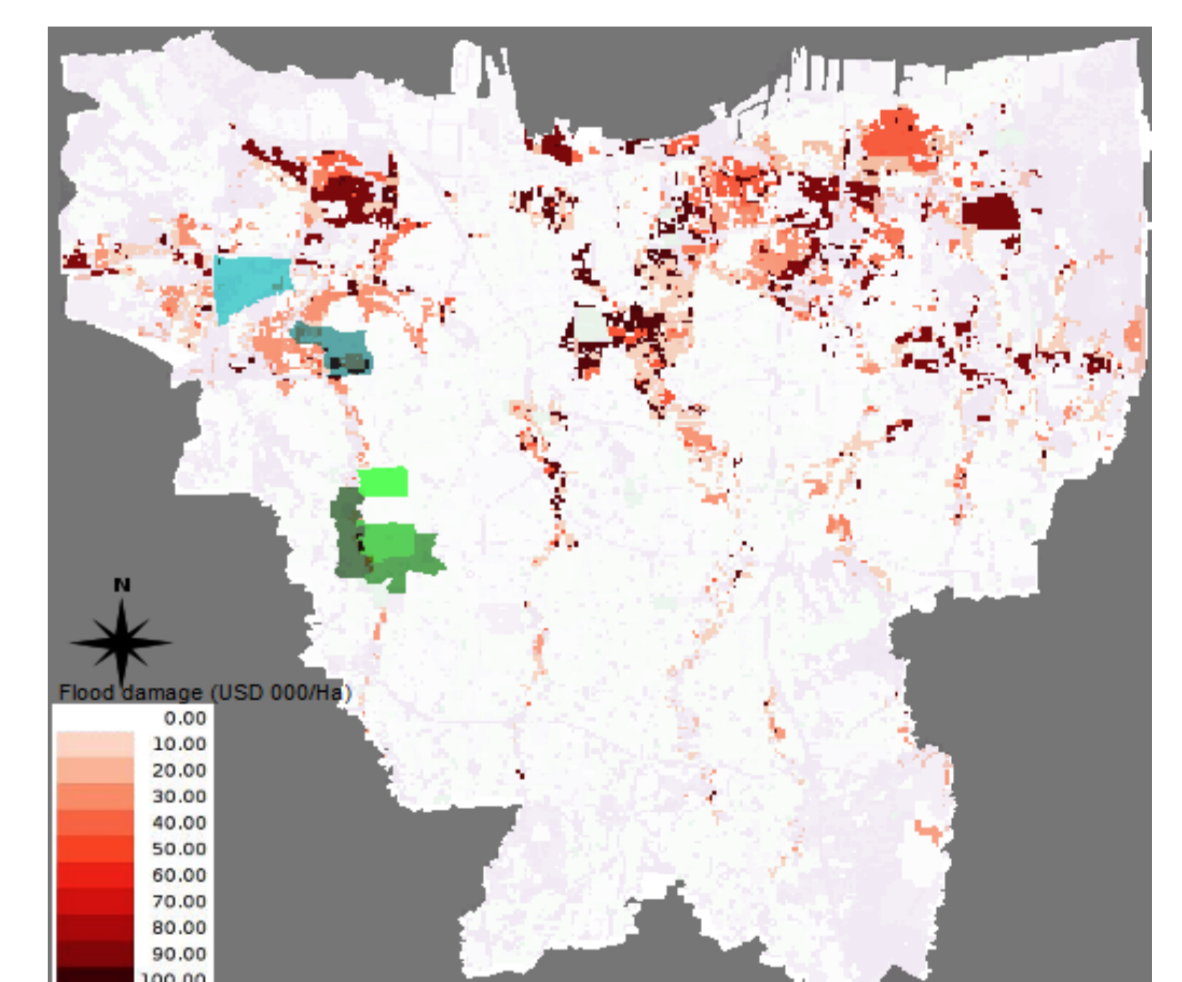| Sector	Flood damages (US$)	
	Survey	Expert-GIS
Households	525,120	1,318,235
Business units	682,929	9,248,201

(a)

(b)
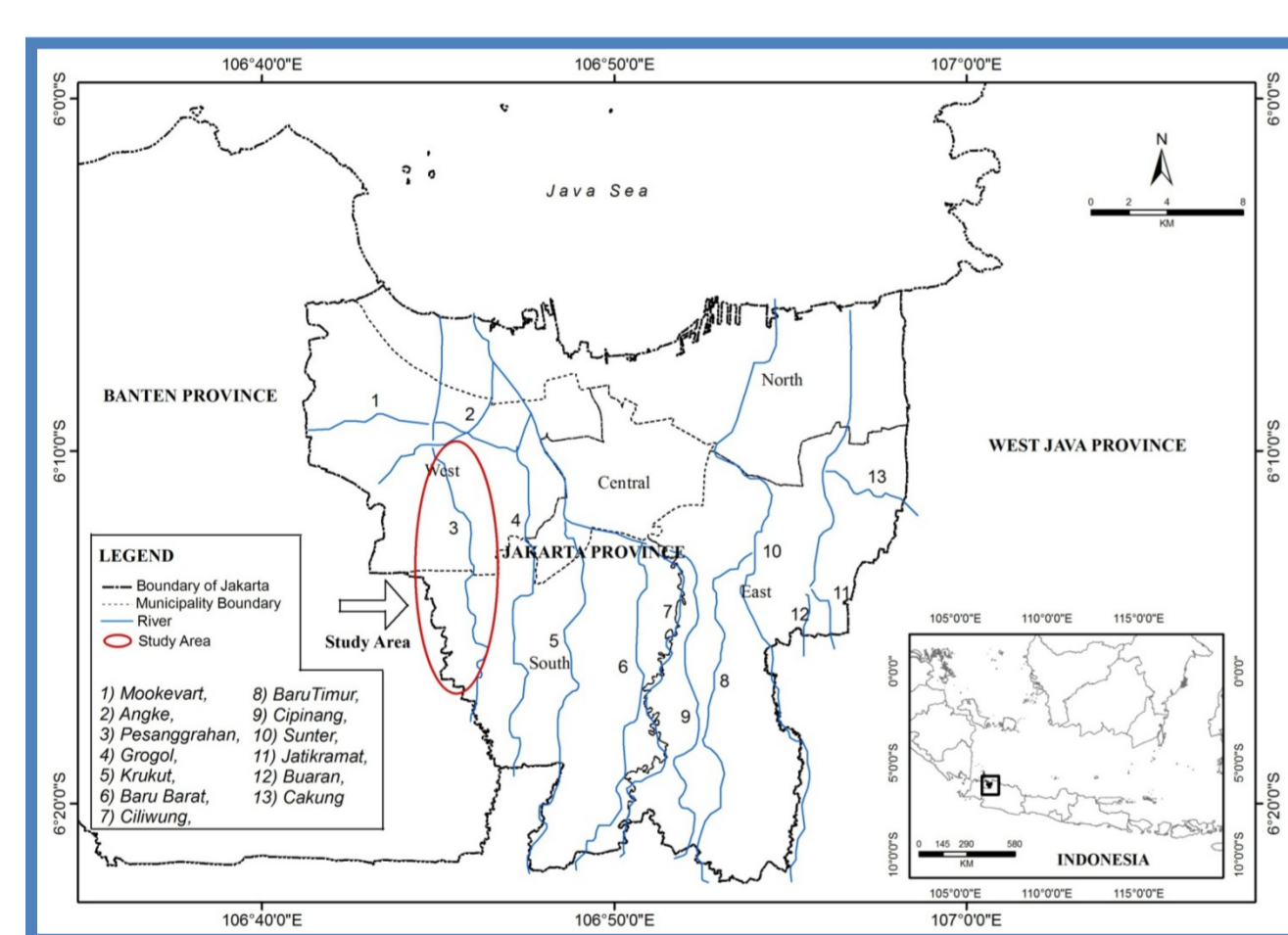
Figure 1. (a) Study area, (b) Vulnerability curves, (c) Flood damage in Jakarta under different exceedance probabilities, and (d) Flood damage map under a 50-year flood return period
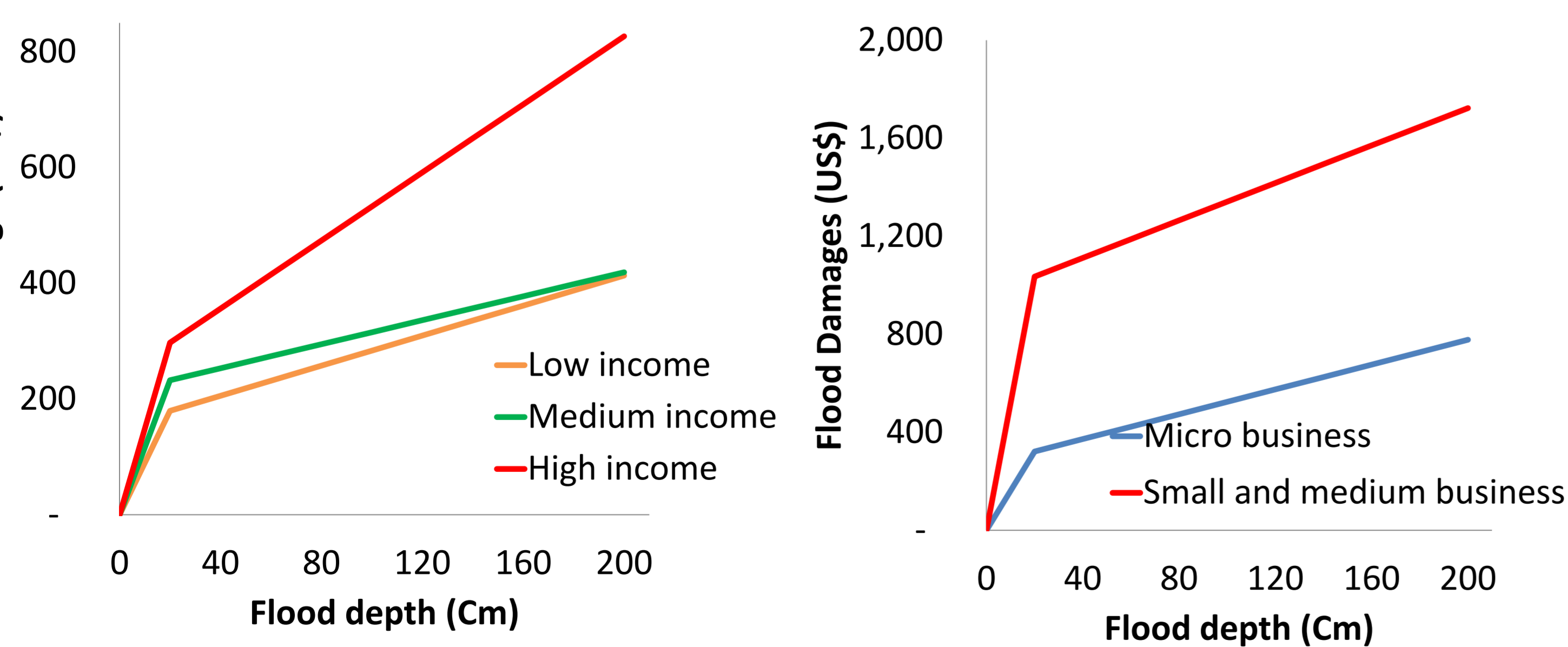

Figure 2. Stage damage curves for households by income groups (left) and for business units by size (right)

Methods

✓ **Statistical method:**
- Survey 300 households and 150 business units along *Pesanggrahan* river for damages due to flood in January 2013.
- Estimate the actual flood damage model by OLS:

$$AFD_i = \beta_0 + \beta_1 DEP_i + \beta_2 DUR_i + \beta_3 DIS_i + \beta_4 INC_i + \beta_5 ARE_i + \varepsilon_i$$

where:
AFD_i : actual flood damage (US$),
DEP_i : flood depth (cm) ,
DUR_i : flood duration (hours),
DIS_i : distance from river to the building (or housing) (m),
INC_i : family income (IDR/month),
ARE_i : building (or housing) area (m[2]),
ε_i : error term.

✓ **Experts-GIS:**
- Use expert workshops to obtain a vulnerability curve,
- Combine it with the *Damagescanner* model.

(c)

(d)

Conclusion

✓ For both sectors, flood depth, flood duration, income, and building area have significant positive impacts on flood damage.

✓ The statistical estimated damages are lower than the expert-GIS approach, due to the following reasons:
- the household survey was conducted in low and medium income areas, whereas expert/GIS also covers high income areas,
- the business survey was conducted to micro, small and medium business, whereas expert/GIS also includes large business.