Economic evaluation of Payments for Forest Ecosystem Services (PFES) programs in Vietnam

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Background

–   Collaborative work between USYD and UNIPD: Master student from UPadova on exchange at USYD

–   Based on the work by a Vietnamese PhD student at USYD who has recently submitted his thesis.

–   Focused on forest ecosystem services, but the findings are of wider significance for environmental programs in general and payment for ecosystem services programs in particular
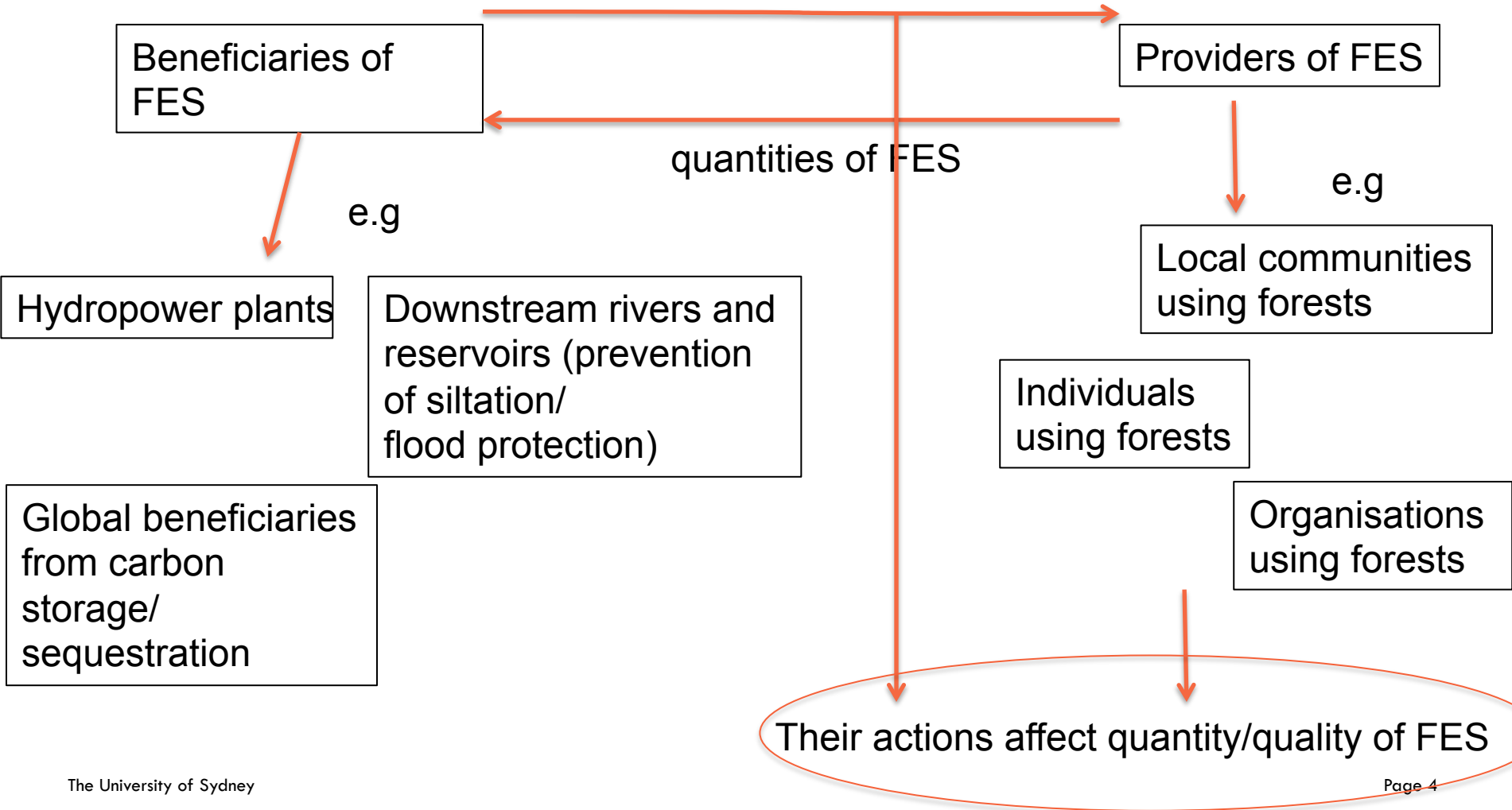
What it is about?

- It is about two things:
  - Assessing whether the actual monetary payments under the Payments for Forest Ecosystem Services (PEFS) program currently in operation in Vietnam are in line with the values of FES (as estimated by Nguyen, 2016)

  - Estimating the difference in payments based on average per hectare payment (as is currently done) and payments based on actual value of FES provided at a spatial scale (as it is supposed to be done)
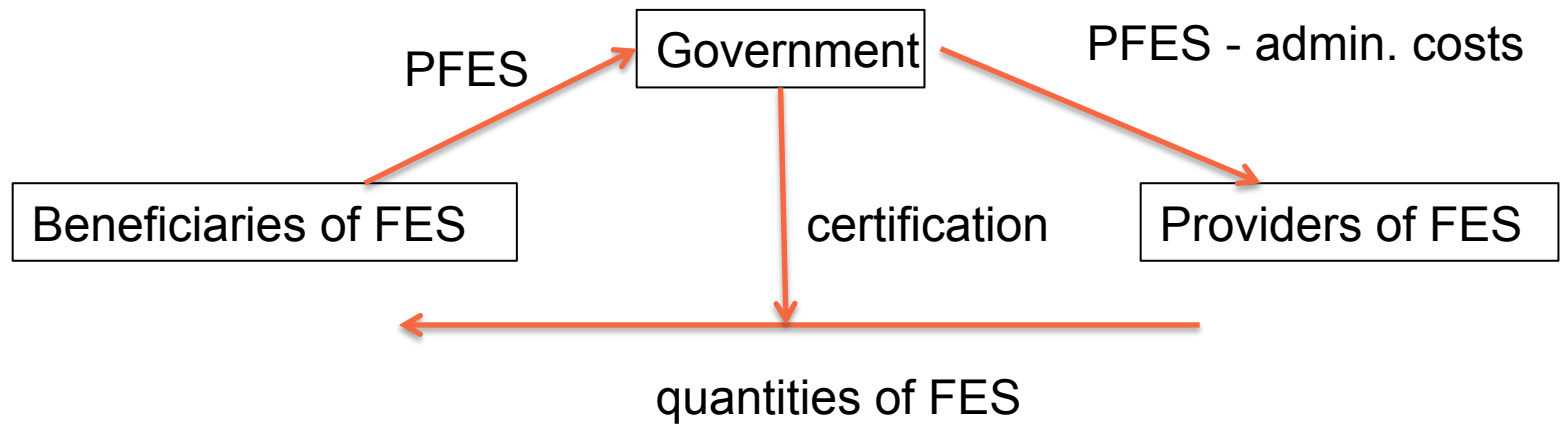
What are Payments for Forest Ecosystem (PFES) Programs? Key ideas behind PFES

payments for FES

Beneficiaries of FES → Providers of FES

quantities of FES

e.g

Hydropower plants

Downstream rivers and reservoirs (prevention of siltation/ flood protection)

Global beneficiaries from carbon storage/ sequestration

e.g

Local communities using forests

Individuals using forests

Organisations using forests

Their actions affect quantity/quality of FES

Government can step in to facilitate the process

PFES

Government

PFES - admin. costs

Beneficiaries of FES

certification

Providers of FES

quantities of FES
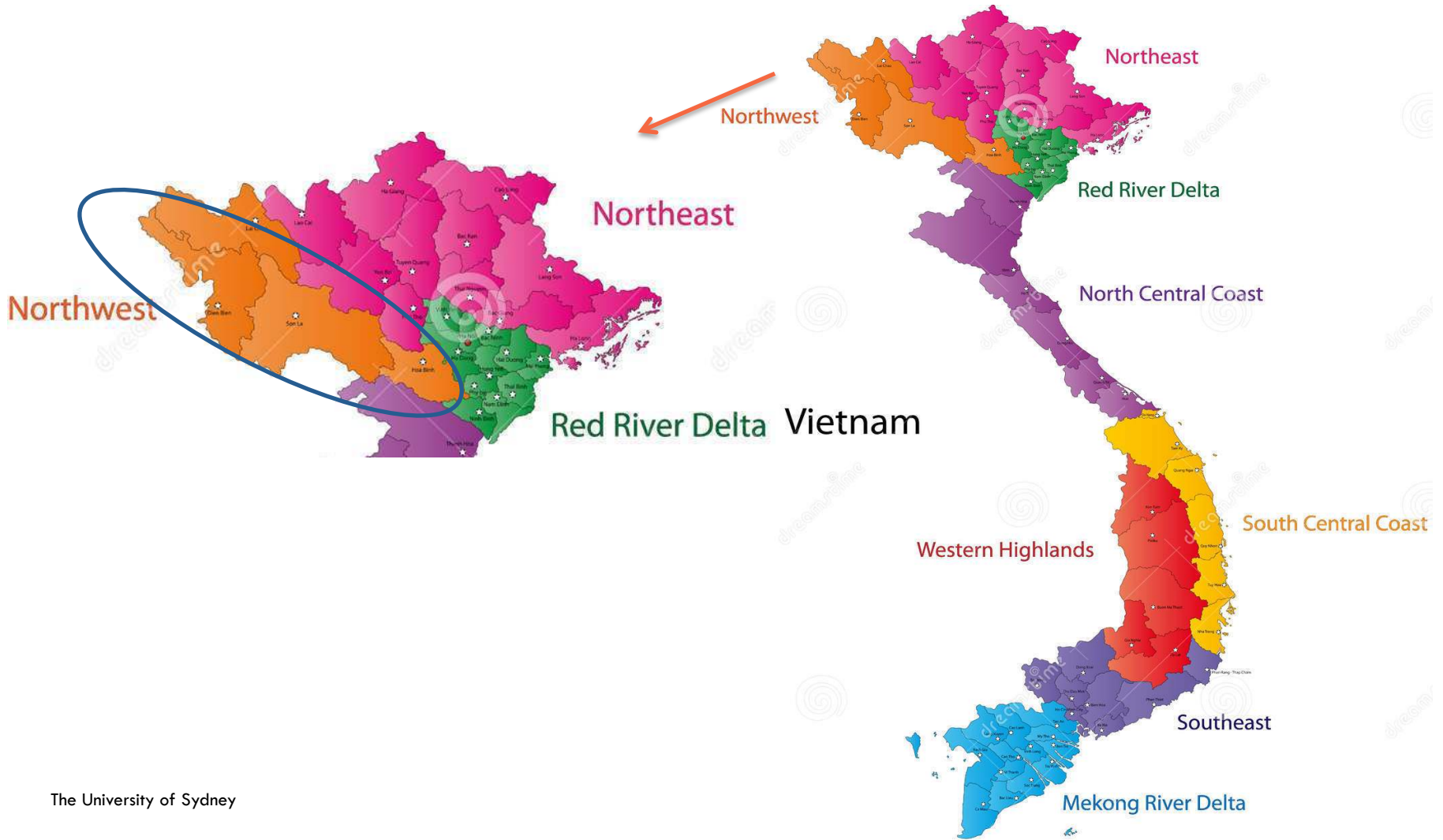
Example with the PFES program in Vietnam

- One can say that Vietnam is one of countries at the forefront globally in terms of implementation of PFES

- There is an existing program for PFES, where hydropower plants, water providing utilities, and tourist agencies operating in forested area pay for FES that their businesses are based on.

- Hydropower plants pay 20 VND/kWh = 0.008 euro/kWh (accounts for >98% of all funds collected)

- Water supply utilities pay 40 VND/m^3 = 0.016 euro/m^3

- Tourist agencies pay 1-2% of the revenue generated from organizing visits to forested areas.

Are the values and payments aligned?
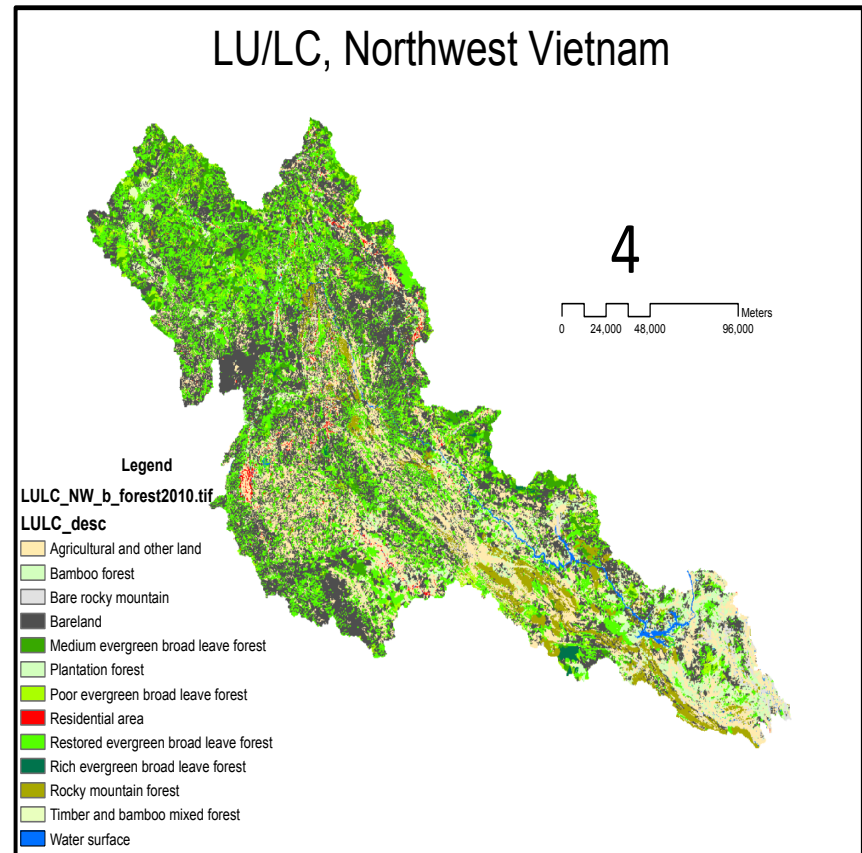

PFES

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PFES - admin. costs

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Value of FES
(as a function of quantity)
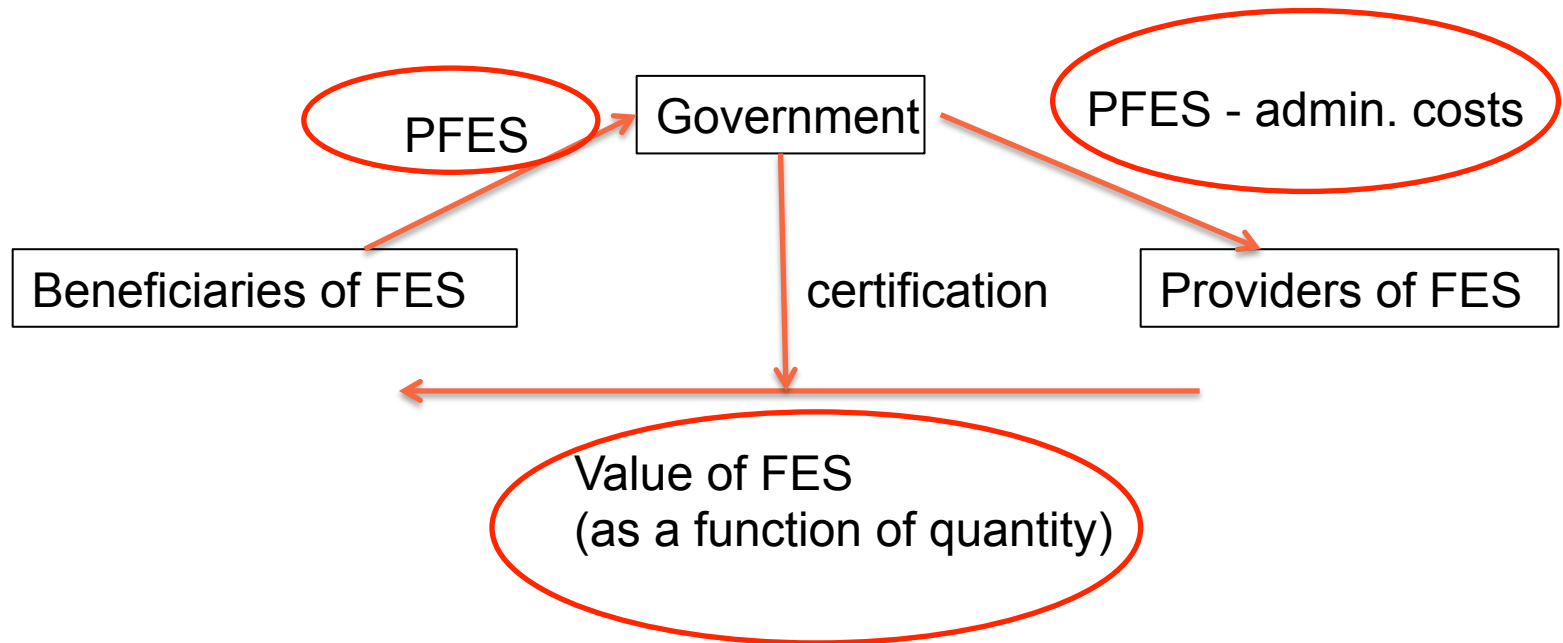
Methods: Quantities of FES

- LULC based study of a mountainous area in the North West of Vietnam;

Land Use Land Cover (LULC)

2010 LU/LC	Area (ha)	Area (%)
Restored evergreen broad leave forest	668,711	27.0
Poor evergreen broad leave forest	124,774	5.0
Medium evergreen broad leave forest	118,011	4.8
Rocky mountain forest	101,599	4.1
Plantation forest	48,204	1.9
Timber and bamboo mixed forest	46,272	1.9
Bamboo forest	36,898	1.5
Rich evergreen broad leave forest	3,772	0.2
Total forested	1,148,242	46.3
Bareland/shrubland	880,805	35.5
Agricultural and other land	395,518	16
Water surface	27,890	1.1
Residential area	14,209	0.6
Bare rocky mountain	11,741	0.5
Total non forested	1,330,163	53.7
Total	2,478,405	100

LU/LC, Northwest Vietnam

Legend
LULC_NW_b_forest2010.tif
LULC_desc
- Agricultural and other land
- Bamboo forest
- Bare rocky mountain
- Bareland
- Medium evergreen broad leave forest
- Plantation forest
- Poor evergreen broad leave forest
- Residential area
- Restored evergreen broad leave forest
- Rich evergreen broad leave forest
- Rocky mountain forest
- Timber and bamboo mixed forest
- Water surface

From LULC to quantities of FES to values of FES

- Use **InVEST** model (**Integrated Valuation of Ecosystem Services and Tradeoffs**) to quantify the ecosystem services. (http://www.naturalcapitalproject.org/invest/)

- Valuing water yield FES through the residual value of water supply for hydropower production.

- Valuing the reduction of sediment load FES via replacement cost of removing sediment deposited in water reservoirs which is a service to the water utilities and water infrastructure companies.

- Valuing carbon storage and sequestration FES via the social cost of carbon (not pursued further here).

Estimating the payments under the PEFS in the study area

- Total amount of funds collected by the government under the PFES program (>98% from hydropower plants)
- Attributed to forested areas only (sub-watersheds with at least 60% forest cover)

$$P_{i,n} = \frac{B_n - t}{A_n}$$

- Where $P_{i,n}$ = payment to sub-watershed i that provides water supply FES to user n (hydropower plant); B_n = total payment collected from user n; A_n = forested area (ha) in the watershed that provides water supply FES to user n; t = administration (transactions) cost.
- This is a uniform per ha payment at a sub-watershed level (as is currently practice under the PFES in Vietnam)

Finding 1

- Are the actual monetary payments under the Payments for Forest Ecosystem Services (PEFS) program currently in operation in Vietnam in line with the values of FES?

- No!

Water-shed id	Value of FES water yield (2010 USD/ha)	Value of FES sediment retention (2010 USD/ha)	Cumulative value FES water yield + sediment retention (2010 USD/ha)
	2010	2010	2010
1	45.5	126.5	172.0
2	38.9	130.0	168.8
3	47.5	116.1	163.7
4	34.4	62.7	97.1

Water-shed id	Payments made by the government (2010 USD/ha)		
	2010		
1	7.6		
2	7.6		
3	7.6		
4	7.6		

Ratio of the Value of FES to actual payments for FES

Water-shed id	Aggregate FES value/Payments mandated by the government		
	2010		
1	22.5		
2	22.1		
3	21.4		
4	12.7		

Addressing spatial heterogeneity

- Take into account specifics of each sub-watershed based on the following:
  - K1=forest status

    poor, medium, rich forest
  - K2=type of forest

    production, protection, special-use
  - K3=origin of forest

    plantation, natural
  - K4=accessibility of forest (difficulty in forest protection)

    slope, distance from road, distance from village

- K coefficient = K1 x K2 x K3 x K4

- It is already in the PFES regulation but never implemented in practice due to resistance from forest users as a perceived source of inequality.

Estimating payments adjusted for spatial heterogeneity

- Use an adjusted payment formula, where forested area in individual sub-watersheds is taken into account
- Attribute payments to an individual sub-watershed based on its forested area, and its specific characteristics (the K coefficient)

$$P_{i,n} = \frac{B_n - t}{A_{i,n}} * K_i$$

Finding 2

- Is there a difference in payments based on average per hectare payment (as is currently done) and payments for FES made at a spatially explicit scale (as it is supposed to be done)?

- Yes!

Payment FES government 2010
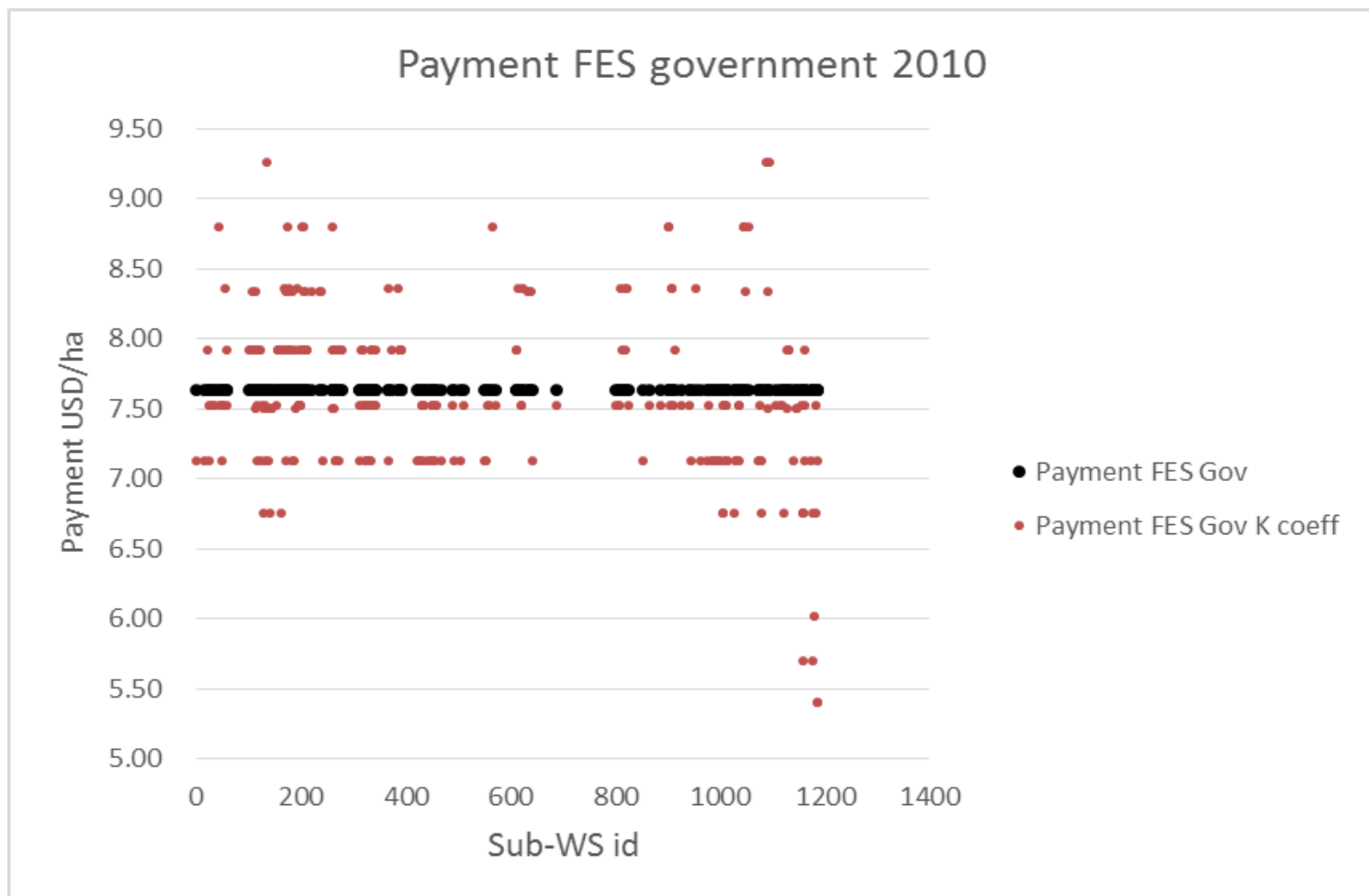
Conclusions and policy implications

- PFES program in Vietnam is an excellent initiative, and Vietnam should be credited for implementing it.
- However, the rates of payments are way too low and are not even remotely in line with the value of FES provided.
- This is not unique to Vietnam, and not unique to PFES.
- Many environmental programs suffer from rates that are too low and do not ensure environmental effectiveness (e.g. NSW LBL (Ancev et al. 2011; Contreras et al. 2014))
- Average per hectare payments further worsen the situation, as spatial heterogeneity in the value of FES is not taken into account.
- Policy implication:
    - increase the rates of payments under the PFES programs;
    - implement the K coefficient;
    - reduce the administrative (transactions) cost.