

Supplementary Materials: Enhancing the Economic Value of Large Investments in Sustainable Drainage Systems (SuDS) through Inclusion of Ecosystems Services Benefits

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A detailed calculation of Cost and Benefits of SuDS and conventional drainage system in Montevideo, Uruguay are presented in this section. All the costs and benefits are based on the local rates of construction materials and labour charges that are prevalent in Montevideo and Buenos Aires, which were collected from green roof module suppliers such as Verdefacil, Maria Pietranera; consultancies such as CSI Ingenieros S.A; and from Municipality of Montevideo.

The total costs of Sustainable drainage systems (SuDS):

$$TC = \sum_{i=1}^n Nr_i \times C_i$$

Where,

TC : total cost of SuDS (US\$),

n : number of types of SuDS elements considered,

Nr_i : number of units (or square meters) of the i^{th} SuDS element ,

C_i : unit costs (US\$/m² or US\$/unit) of the i^{th} SuDS element, which is already the PV of all initial and future costs.

Also the benefits are calculated on an area or unit basis (i.e. US\$/m² or US\$/unit). For a particular candidate solution, the total present value of the ES benefits:

$$TESB = \sum_{i=1}^n Nr_i \times ESB_i$$

Where,

$TESB$: total ES benefits of SuDS (US\$),

n : number of types of SuDS elements considered,

Nr_i : number of units (or square meters) of the i^{th} SuDS element,

ESB_i : unit Ecosystem Services' benefits (US\$/m² or US\$/unit) of the i^{th} SuDS element. Note that this is already the PV of all initial and future benefits.

Table S1. Characteristics and costs of designed underground storages

Storage	Depth (m)	Area (m2)	Total cost (a) (US\$)	Total unit cost (US\$/m2)	Total unit cost (US\$/m3)
Liceo	4.0	3,170	4,042,450	1,275	319
Quijote	3.6	1,500	2,817,877	1,879	522
Conservación	3.7	1,800	3,017,139	1,676	453
^a Includes all the works: inlet and outlet structures, electromechanic devices, urban conditioning, etc.					

Table S2. Costs of green roofs

Item	Private Cost (US\$/m ²)	Social Cost (US\$/m ²)	Total Cost (US\$/m ²)
Investment - Green roof with plants	70	-	70
Maintenance	54	-	54
Air pollution	-	18	18
Landfill cost	-	0.02	0
Total	124	18	142

Table S3. Costs of rain barrels

Item	Cost (US\$)
Rain barrel with sealed top	121
Tee 110 mm	10
1 m Pipe 110 mm	6
Bend 45 110 mm	5
Filter 110 mm	15
Stand	50
Labour	30
Maintenance	63
Total cost (US\$)	300
Cost per volume (US\$/m ³)	500

Table S4. Ecosystem services' benefits of green roofs

Item	Private Benefit (US\$/m ²)	Social Benefit (US\$/m ²)	Total Benefit (US\$/m ²)
Reduced building energy consumption for cooling & heating	16.1	-	16.1
Private land and property values uplift	71.4	-	71.4
Food production	6.4	-	6.4
Longevity of roofs	30.2	-	30.2
Avoided carbon emissions from building energy saving	-	3.8	3.8
Energy and carbon emissions savings from reduced storm water volume entering combined sewers	-	0.1	0.1
Avoided costs for air pollution control measures	-	1.7	1.7
Aesthetics	-	2.5	2.5
TOTAL	124.1	8.0	132.1

Table S5. Ecosystem services' benefits of rain barrels

Item	Private benefit (US\$/barrel)	Social benefit (US\$/barrel)	Total benefit (US\$/barrel)
Main water saving	123	-	123
Energy & Emissions saving	-	2	2
Total	123	2	125



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