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Swiss Agency for Development
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EPFL

Section Sciences et Ingénierie de l'environnement Design Project 2021 (semestre de printemps)

Proposition n°37

**The economics of wastewater treatment in water intensive manufacturing processes –
e.g. example of textile manufacturing in Ethiopia**

Partenaire externe

Simon Zbinden

simon.zbinden@eda.admin.ch

Téléphone 079 259 19 14

Swiss Agency for Development and Cooperation (SDC) – Global Programme Water

Freiburgstrasse 130, 3003 Bern

deza.admin.ch

Encadrant EPFL

Prof. Christof Holliger

EPFL ENAC IIE LBE

CH C3 425 – Station 6

1015 Lausanne

christof.holliger@epfl.ch

021/ 693 47 24

Descriptif du projet

Wastewater is a global concern. Current estimates indicate that well over 80% of the world's wastewater is released into the environment without any treatment. In developing countries, up to 95% of the wastewater remains untreated. Releasing wastewater into the environment has a direct impact on the biological diversity of aquatic ecosystems, disrupting the fundamental integrity of life support systems on which a wide range of sectors from urban development to food production and industry depend. Apart from domestic wastewater from households, industry and a number of manufacturing processes are water intensive and produce considerable amounts of wastewater. It is estimated that nearly 20% of global wastewater is produced by the fashion industry. The majority of the production sites of this industrial sector is located in developing countries. In most cases, the wastewater from clothing manufacturing is released into the environment without treatment. In economic terms, *the non-treatment of wastewater is an externalized cost to the production*. The costs are borne by the society and future generations in the form of a polluted environment, reduced clean fresh water, less ecosystem services, health problems, etc. Environmental full-cost accounting (also referred to true costing accounting) requires that the cost of wastewater treatment be internalized in the production costs. Methods and technologies for wastewater treatment, from simple to very sophisticated



ones, are readily available. However, in developing countries with poor regulatory frameworks and insufficient enforcement, such technologies are rarely employed. The cost of wastewater treatment depends on a number of factors including type of wastewater, treatment level, treatment technology and scale, for the latter assuming decreasing per unit treatment cost with larger treatment quantities (scale effects).

The marginal cost of production of clothing is typically a fraction of the retail price in industrialized countries. A t-shirt with a retail price of 30 Swiss francs in Switzerland can have production costs as low as 3 dollars in Bangladesh or Ethiopia. An open question remains to what level the internalization of wastewater treatment cost increases the marginal costs of production and whether the increase would be significant enough to put the manufacturer at a comparative disadvantage on the global market.

Objectif et buts

Overall goal

The overall goal is to understand if the economics are a real barrier to improving the responsibility of industries in the treatment of their wastewaters. With the example of a selected clothing plant/manufacturer, estimate the marginal cost (for example trousers, t-shirt, etc.) of wastewater treatment and the increase in the marginal cost of production (increase in total per unit cost).

Objective 1: Analysis of the cost structure in the fashion industry, based on the case study of a piece of clothing.

Objective 2: Analysis of the degree of contamination, quantity of wastewater in the fashion industry, as well as the acceptable required treatment level for the wastewater to be released into the environment.

Objective 3: Analysis of the treatment options / technologies, suitable for developing countries (considering context specific limitations such as human capacity constraints, energy insecurity, etc.), including their costs.

Descriptif tâches

- 1) Literature review and internet search
- 2) Select 1) a clothing plant/manufacturer in a developing country with a known or an estimated cost structure, 2) select a suitable treatment technology with known costs and an acceptable treatment level
- 3) Estimate the marginal cost of treatment and the marginal cost of production
- 4) Draw conclusions, put the results into perspective for the manufacturer and the society.
- 5) Optional (if data and time allow): Conduct a sensitivity analysis taking a) different treatment levels (assuming higher marginal costs with higher treatment level) and b) scale (assuming lower marginal costs with larger quantities treated).

Divers

As considerable literature exists on the above mentioned field of research (in peer-reviewed journals, grey literature, internet) and the COVID-19 pandemic makes travelling difficult, this work can be conducted based on a complete desk review.

The supervision provided by the Global Programme Water division will also allow linkages and collaboration with various relevant partners.



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The angle of this proposal can be revised more narrowly or broadly, depending on the interests of the students.