



## Final Year Project Showcase Batch 2018 Year 2022

<b>Department: Textile Engineering</b> Programme: <u>Textile Engineering</u>		
<b>1</b>	<b>Project Idea</b>	<b>Evaluation of Textile Effluent Treatment Plant (ETP) sludge properties for use in building material.</b> This project is proposed by a reknown textile industry of Pakistan to achieve UN SDGs. Project will now be proposed to next batch for further investigations.
<b>2</b>	<b>Process</b>	ETP sludge was characterized which confirmed the sludge use as a cementitious material. After drying and grinding, the concrete samples were fabricated using sludge and developed mix designs. Sludge was replaced with 10%, 20% and 30% of cement. These concrete samples were then tested for mechanical properties
<b>3</b>	<b>Outcome</b>	Results show the potential reuse of sludge as a cement replacement material and confirmed the pozzolanic behavior to replace cement in concrete. Hence, the now toxic sludge can be safely utilized as a building material like paver and paver blocks. It also reduces the consumption and negative impact of cement on the environment, as cement contributes to toxic emissions, noise vibrations, and also landfill pollution.
<b>4</b>	<b>Evidence (Theoretical Basis)</b>	The chemical characterization of ETP sludge confirmed the presence of pozzolans, namely aluminum and silicon, along with that traces of heavy metals. Physical characterization showed the fineness to be 128um which falls in the range of cement. Therefore, use of sludge as a cement replacement material is evident. For the very same reason, various mix designs were prepared, consisting of, coarse and fine aggregates, cement, sludge and water. The sludge was replaced at 10%, 20% and 30% of cement. The required fine and coarse aggregates were sieved and the mix designs prepared in mixer, the samples in the form of cylinders and beams were casted. After curing, mechanical properties (compressive, flexure, split tensile) and slump of concrete were tested. It is found that ETP sludge can be used in the application of building materials not required lot of strength like for paver blocks bearing light to medium loads. Polypropylene fibres were also added to the concrete however this combination needs further investigation which will be carried out in future investigation.
<b>5</b>	<b>Impact on Sustainability of Urban Regions or SDG-11 "Sustainable Cities and Communities"</b>	A solid waste which generates from the Effluent Treatment Plant of the textile processing mills, commonly known as "sludge"; will now be utilized as building materials as an outcome of this project. Industrial practice is either disposed sludge of in land or



		<p>incinerated; which poses a potent threat to human health and lives over the land and under the sea.</p> <p>A sustainable use of ETP sludge is proposed for carbon reduction either and effectively manage a waste product to support sustainability and circularity for urban renewal.</p> <p>A by-product/waste 'sludge' can now be utilized 30% in concrete of the total in replacement of the cement which not only reduces the cost for the development of different building materials for cities and communities but also reduce hazards of consuming cement to save environment from further damages.</p> <p>In extension of this project, a pilot study being initiated by the industry and us, in which building materials prepared using ETP Sludge be consumed for the development of a village, to attain a goal of "Sustainable cities and communities".</p>
6	<b>Competitive Advantage or Unique Selling Proposition</b> (Cost Reduction, Process improvement, Attainment of any SDG (Sustainable Development Goal), increase of market share or capturing new market or having superior performance over a competitor. In summary, any striking aspect of the project that compels the industry to invest in FYP or purchase it. Some detailed description is required in terms of how, why when what. You can select one or more from the following dropdown and delete the rest of them). Please keep relevant options, delete the rest of them, and correct the sequence	
a	<b>Attainment of any SDG</b> (e.g. How it is achieved and why it is necessary for the region)	<p><b>SDG#3: Good Health and Well being</b></p> <p><b>SDG#9 Industry, Innovation and Infrastructure</b></p> <p><b>SDG#11: Sustainable Cities and Communities</b></p> <p><b>SDG#12: Responsible Consumption and Production</b></p> <p><b>SDG#13 Climate Action</b></p> <p><b>SDG#14 Life Below Water</b></p> <p><b>SDG#15 Life on Land</b></p>
b	<b>Environmental Aspect</b> (e.g. carbon reduction, energy-efficient, etc.)	Inefficient ETP sludge disposal poses a potent threat to flora, fauna, and human health. A sustainable use of ETP sludge is proposed in this project for carbon reduction, save over and under land life, aquatic life and effective use of a waste product.
c	<b>Cost Reduction of Existing Product</b>	A by-product sludge which is either dumped in land or incinerated, can now be utilized as building material. 30% of the cement used can be replaced by sludge so the cost of the concrete can be reduced accordingly for development of different building materials.
d	<b>Process Improvement which Leads to Superior Product or Cost Reduction, Efficiency Improvement of the Whole Process</b> (e.g. What is the issue is current process and what improvement you suggests)	<p>Textile industry produces huge amount of sludge from effluent treatment plant. Removal of ETP sludge is a standout among the most difficult natural issues in wastewater treatment methodologies. Most of the industries have to dump the sludge in landfills or incinerate which leads to the soil, air, surface water, and groundwater contamination. These contaminations cause respiratory problems, cancer, skin diseases, and many other problems. Thus, the increased carbon footprint has created an alarming situation.</p> <p>It is becoming a global challenge to effectively and efficiently use sludge, a suitable alternative for waste</p>



# SUSTAINABLE URBAN REGIONS

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		disposal. This projects presents an insight on the characterization of sludge and has explored how the mechanical properties of concrete are affected when cement is replaced with sludge, in order to investigate it's usage in the building material to save environment, use a waste product in urban planning which eventually may reduce cost of constructing materials.
e	<b>Expanding of Market share</b> (e.g. how it expand and what is the problem with the current market)	Problem with the textile industry is the use of sludge without compromising on the sustainability/environment. Now textile industry which is growing and investing in different businesses so sludge can be utilized in their own businesses plus construction industry can also make use of ETP sludge. Polymer/synthetic fibres manufacturing industries can also explore to improve/ develop their products accordingly.
f	<b>Capture New Market</b> (e.g. Niche market or unaddressed segment)	urban planning and development, Construction, Textile industries and Polymers / recycleable synthetic fibres manufacturing industries
g	<b>Any Other Aspect (Please tag it like above options)</b>	Textile industry would now be able to utilize a waste product which would aid in achievement of SDGs. would also attract more international buyers/customers strictly focused on circular economy/sustainability. Since the concrete prepared is less in strength to be used for heaving loading so there is a potential to add recycleable synthetic fibres to increase strength of products
7	<b>Target Market</b> (Industries, Groups, Individuals, Families, Students, etc) Please provide some detail about the end-user of the product, process, or service	1) Human beings, life on and below land, under sea 2) Textile and construction industries as they can now use a sustainable alternative for sludge and safely be utilized it. For the construction industries the harmful cement can also be replaced. This will help achieve circularity in terms of etp process which in turn helps the communities and cities. 3) Help textile industries to attain to open a market in urban planning for them. 4) Will increase export of textile industries and synthetic fibres manufacturing inductires by having more customers
8	<b>Team Members</b> (Names along with email address)	Mishkat Rabbani (TE-18046), rabbani4100732@cloud.neduet.edu.pk Masooma Azhar (TE-18047), masoomaazhar909@gmail.com Wareesha Jamal (TE-18050), wareeshajamal09@gmail.com Kainat Ayoob (TE-18060), kainatayoob30@gmail.com
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10	<b>Video (If any)</b>	<a href="https://drive.google.com/file/d/1tz9jiVmAjthKNrllSHx-uh4HsMuq1cHJ/view?usp=sharing">https://drive.google.com/file/d/1tz9jiVmAjthKNrllSHx-uh4HsMuq1cHJ/view?usp=sharing</a>



**ETP sludge to be used as construction material**



**Beam developed using ETP sludge for testing**