

## **Research Plan and Publications of the Department of Environmental Sciences- Faculty of Science**

The research strategy of the department includes specialized and interdisciplinary aspects of Environmental Sciences, with the objective of studying and solving of various contemporary environmental issues, with particular emphasis on what is relevant to Egyptian arid environments, cities, water bodies and marine ecosystems. The strategy gives priority to studying the environmental problems of Egyptian northwestern coast, and its hinter land and sea. Specialized studies include rehabilitation of degraded ecosystems, waste and soil pollution, urban sprawl, environmental planning.

The points of research are directly addressing the above problems, deploying recent technologies, e.g., remote sensing, GIS and Modeling. Recent analysis instruments are also used for the qualitative and quantitative analysis of research samples.

**The strategy includes the following specific topics for the period between 2020-2023:**

1. Monitoring and assessment of environmental pollution (air pollution - pollution of water bodies - groundwater pollution - coastal pollution - radiation pollution) using chemical and physical methods and biological indicators from plants and benthic foraminifera.
2. Environmental monitoring and surveys (using remote sensing techniques and geographic information systems to conduct environmental monitoring and desertification studies).
3. Waste recycling and management (industrial wastes either liquid or solid).
4. Environmental impact assessment of industrial projects and various facilities.
5. Science of pollen and spores and monitoring climate changes and recent changes in vegetation.
6. The environmental, social and economic impacts of environmental pollution and exotic plants on biological diversity and the composition of vegetation in natural and agricultural ecosystems.
7. Generating renewable energy and water treatment using nanotechnology and natural materials.
8. Phyto and biological remediation of polluted environments.
9. Use of plant extracts as corrosion inhibitors in metal pipes.
10. Environmental and agricultural applications of nanoscience.

11. The impact of pollution on species and ecosystems.
12. Sustainable synthesis of nanomaterials/nanocomposites and their environmental applications.

**The strategy includes the following specific topics for the period between 2023-2028:**

1. Ecofriendly technologies for wastewater treatment.
2. Boosting climate change adaptation via agricultural wastes recycling.
3. Green synthesis of novel nanocomposites for environmental, medical and industrial applications.
4. Environmental sustainability stewardship by the green synthesis of biodegradable plastic.
5. Integrating spectral techniques and spatial modeling for mapping and monitoring of soil salinity.
6. Applying artificial intelligence and automated techniques for monitoring soil salinization.
7. Automated geospatial analysis of shoreline changes for the prediction of future trends.
8. Mapping groundwater potential zone using geophysical and multi-criteria techniques.
9. Water/Wastewater treatment and reuse using natural by-products and carbon-based biomaterials for water treatment and management (Biochar, Graphene, Biochar nanocomposites, MOFs, etc.).
10. Nanomembranes applications for desalination and water management.
11. Integrated Waste Management (Waste Valorization, Circular economy, Microplastics).
12. Artificial Intelligence for sustainable water and soil remediation.
13. Bio-based plastics for environmental and industrial applications.
14. Assessment of human exposure to air pollution and its impacts on human health.
15. Mathematical modeling used in determination of failure mode in wastewater treatment plants.