From data to impact

A "cognitive environmental"
vision for the Middle East

Countries throughout the Middle East face increasing environmental challenges: loss of wildlife, land degradation, poor air quality, and declining water resources are just some of the many examples. The region is also highly exposed to the accelerating impacts of climate change, including heat waves and floods, as seen in the region-wide floods of April 2024.

AI can help respond to these challenges. It is already top of mind for leaders in the environmental sector because the vast data sets that the sector generates and complex connections among its different domains lend themselves to AI applications. AI is being tested to forecast the impact of human activities on air or water quality and to simulate the impact of potential interventions, helping authorities identify and implement the best ones. It is already used to optimize water distribution and manage desalination more efficiently, as well as to predict water demand patterns and manage irrigation systems in agriculture more sustainably.

However, AI's tremendous potential cannot be achieved by implementing stand-alone use cases. Environment ministries and agencies need to integrate AI across their entire operations and business models in a cohesive and systematic way. In other words, they need to transform into "Cognitive Environment" agencies. These would be built on three pillars: streamlined internal processes, enhanced environmental operations, and new business models and services.

1 **The first pillar** focuses on using AI to increase the efficiency of internal processes. It can encompass, for instance, intelligent automation in HR, accounting, or procurement. These tools are often available off-the-shelf and can reduce operating costs as well as release the time employees, including environmental experts, spend on internal tasks.

2 **The second pillar** is the most explored so far among environment agencies: it focuses on using AI to enhance environmental processes that today are executed manually, increasing their quality, speed, and efficiency. For instance, so-called digital twins—digital models that simulate the physical area under an entity's oversight—can be used to assess the topical impact of climate change and develop protective interventions. AI can also revolutionize field operations: to counter poaching, for example, cameras and sensors remotely connected to AI models detect wildlife populations and forecast their movements, while historical poaching incidents are automatically analyzed to identify patterns. Using these inputs, AI applies game theory principles to predict potential poaching incidents and guide rangers or drones to patrol the right locations at the right time.

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> AI can help respond to environmental challenges in the Middle East, thanks to the vast data sets the sector generates. The complex connections among the sector's different domains also lend themselves to AI applications.

3 **The third pillar**, almost entirely untapped so far, is an opportunity to revamp the business models of environmental entities. For instance, AI can test the impact of new construction plans on environmental domains from air and soil to wildlife and habitats, potentially eliminating the need for slower and costlier Environmental Impact Assessments. Likewise, AI can use satellite data, information from air quality monitoring stations, and data on weather conditions to estimate emissions in nearly real-time, removing the need for slow and inaccurate self-reporting of emitters on their own performance.

While quick-win use cases can, and should, be pursued to achieve early impact, building a Cognitive Environment Agency or ministry requires much more than that. Studies show that 70% to 80% of AI projects fail, primarily due to lack of a comprehensive plan that tackles all prerequisites for success.

For environmental agencies, the AI journey should start by setting a clear vision and tangible objectives that span the three pillars of cognitive environmental transformation. A road map of use cases should then be developed to achieve each of the defined objectives, taking into account data quality and sufficiency. The road map should be carefully phased so that each new application builds on the data and applications previously rolled out, to maximize cross-app communication and reduce development cost. While defining use cases, agencies should take special interest in identifying the new business offerings and revenue streams that AI can unlock for them; that could include, for instance, selling accurate and granular climate analytics to urban planners or developers. New capabilities and skills will also be needed. These should be identified and developed or acquired, and agencies will need to reshape their organization to incorporate them effectively.

AI is a costly business; charting a clear path for this transformation is the only way to fully harness its power, and to avoid wasting time and money on failed efforts.

> The environmental sector in the Middle East is ripe for a revolutionary change: ministries and agencies across the region have been collecting environmental data for a long time. AI provides the opportunity to put that data to practical use along a wide range of challenges, thereby leapfrogging into the world's first cognitive environmental model–and making a decisive contribution to improving the environmental outlook both in the region and globally.

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