

TECHNOLOGY IN DEVELOPMENT COULD CHANGE ROLE OF CITIES

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The ancient trend of human movement from rural life to urban centers may now be upended by emerging technologies. Low-cost desalinization, highly efficient battery storage, renewable energy and mobile communications all serve to reduce dependence on the world's cities for water, power and human interaction.

It is becoming increasingly feasible to live, work and thrive in remote locations.



Since time immemorial, people have gazed at the oceans wondering what it would take to convert this vast salty reservoir into potable water. Reverse osmosis for desalination of ocean water has been around for decades, but until now it has been energy-intensive and therefore costly. Graphene oxide framework membranes have been shown to have exceptional water permeability when pore size is increased, resulting in 100 percent salt rejection. Traditional reverse osmosis membranes result in 20 to 80 percent salt rejection, requiring repeat processing and greater energy. This more efficient and effective membrane markedly reduces energy requirements and makes desalination far more feasible on a large scale.

Limitations of batteries — including size, weight, efficiency and associated cost — have long restricted the potential for power storage. Another problem is that powerful batteries die fast, while energy-efficient batteries have low power. Recently, the University of Illinois at Urbana-Champaign released information about the development of a new lithium-ion battery that has both power and energy. This battery is 30 times smaller, charges 1,000 times faster and transmits signals 30 times farther. Parallel research and development initiatives are underway around the world, and all parties are working to minimize the cost of production. At some point long-distance, battery-powered flight will become feasible, and individual residences, even in urban centers, might no longer need to hook up to the grid.

Photovoltaic, solar technology and other renewables are also entering a new phase. In the future the rooftop installations of PV panels may no longer be the norm. Increasingly, PV is being integrated into a range of building materials. Eventually, the complete surface area of motor vehicles might be covered with material that can harness energy from the sun.

This year the globe is also abuzz with the idea of wearable technology. Imagine your shirt being able to charge your cellphone that will provide updates on your tiny lithium car batteries that are being charged thanks to the vehicle's PV paint.

Ira Zunin M.D., M.P.H., M.B.A., is medical director of Manakai O Malama Integrative Healthcare Group and Rehabilitation Center & CEO of Global Advisory Services Inc.
 Please submit your questions to info@manakaiomalama.com

The convergence of these emerging technologies offers far more than convenience and efficiency for a jet-setting urban life. Diagnostic health information from wearable and where-you-are technology will be more readily collected and sent for instant evaluation and timely advice. The Activecor is a tiny device attached to the back of the iPhone that when touched by both hands will check the heart rhythm, which can be transmitted to a cardiologist. The price is \$84. Education also will be completely transformed from knowledge transmission to creative problem-solving.

But consider how much easier it will be to live and thrive on remote islands and cold, sparsely populated extremes of latitude. Moving forward, technology will enable us not only to be healthier and live better; it will also empower us to live far from urban centers and transform the role of the city in modern society.