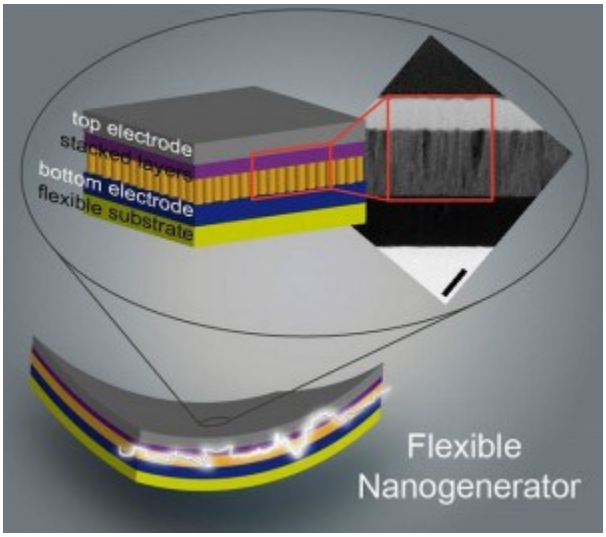
ENERGY POURED IN TO CUTTING-EDGE CONSERVATION IDEAS



Here's a plan for cutting your carbon footprint: fit your electric car with a high-performance lithium sulphur battery that can treble the mileage for a much lower cost.

That's just one of many examples of innovative energy conservation solutions that scientists are currently on the brink of turning into reality. Others include fitting your clothes with zinc oxide nano-generators that can harvest mechanical energy from the moving fabric to charge your portable devices.

Then you could move into a new suburban development carefully planned to maintain all the trees that store and sequester carbon. You'll be in a city anyway − and cities are best placed to plan new energy efficiencies.

Linda Nazar, chemistry professor at the University of Waterloo, Canada, and colleagues believe that a lithium-sulphur battery is one step nearer reality.

Light and cheap

Sulphur is abundant, light and cheap, and a rechargeable sulphur cathode could be so much less costly than the lithium cobalt ion in lithium-ion cells – if only the sulphur could be stopped from dissolving after a few cycles.

She and her team report in report in Nature Communications that ultrathin, nanoscale sheets of manganese oxide could stabilise the sulphides and deliver a cathode that could be recharged more than

2000 times. So far, the Waterloo team claim only to have worked out the mechanism that would stabilise a sulphur battery: there is much more to be done.

Meanwhile, a group at the Korean Advanced Institute of Science and Technology report in Applied Physics Letters that piezoelectric zinc oxide nanotechnology could be used to harvest mechanical energy.

Any movement – any sound, any vibration, any exertion of muscle, any step, any movement of fabric – represents energy that could be turned into electrical current, especially with a little help from exquisitely-designed aluminium nitride insulators.

So someone wearing, for instance, a medical device that monitors heart rate and breathing could actually provide the power for the device just by walking about, or breathing. That's the possibility: more exploration is needed, say the scientists.

Both pieces of research are reports from the frontiers of energy conservation science. But at the University of Florida, one group zeroed in on the oldest carbon storage and sequestration technology of all: the tree.

Homes needed

There are 19 million people in Florida now. By 2040, the population could be 25 million. That's a lot of new homes needed − and it would help if they started off in a conservation-friendly way.

Environmental specialist Richard Vaughn and colleagues report in the journal Landscape and Urban Planning that they looked at a plan to build 1,835 homes on a 700 hectare site that is – for the moment – a managed pine forest.

They grouped the trees according to age and calculated that, since older trees hold more carbon than younger ones, it would make sense to reduce the area for subdivision and group the homes closer together so as to preserve the oldest trees.

One of the designs saved 71% of the original stored carbon and 82% of the carbon that would have been sequestered by the forest.

"If you have a compact subdivision, you'll have fewer roads," said one of the Florida report authors, Mark Hostetler, professor specialising in biodiversity conservation. "With fewer roads, you have less energy used to produce the roads.

Patches for wildlife

“That impacts how much carbon is released. With more patches of biodiversity, you also have natural patches for wildlife. And there’s water. With compact neighbourhood design you’ve decreased the pavement and you’ve kind of separated the built areas from the natural areas.”

All urban areas offer scope for energy savings, because all cities generate a higher proportion of carbon emissions than rural areas.

Felix Creutzig. head of the land-use, infrastructures and transport group at Mercator Research Institute on Global Commons and Climate Change, Berlin, and colleagues looked at energy and emissions data from 274 cities in 60 countries – cities home to 21% of the global urban population – and considered the future under a “business-as-usual” scenario.

They report in the Proceedings of the National Academy of Sciences that energy use would triple by 2050. Another two to three billion people would crowd into the cities, and the urban “footprint” would grow by 1.2 million square kilometres – an area the size of South Africa.

Some thoughtful urban planning and energy policies, however, could make a big difference − especially if the planners got to work early.

“This window of opportunity exists especially for low-emissions cities in Asia, the Middle East, and Africa, where urbanisation and associated rises in income could lead to high increases in urban energy use if current trends continue,” they report.

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