

Cars go green but emissions grow

ELECTRIC CARS CAN ONLY BE SEEN AS ECO-FRIENDLY AS THE ELECTRICITY THEY USE, WRITES ANANTHANARAYANAN

India is pursuing a scheme named *Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME)*, launched earlier this year with an outlay of Rs 800 crore. The objective is said to be conservation of energy that will help in reducing environmental pollution. And in the week just before the Global Summit at Paris to combat climate change, a promotional motor rally, the 3-Cities FAME India Eco Drive was flagged off at the Red Fort in New Delhi and also in other cities.



units (kilowatt hours) on a 100-km run. At even Rs 10 per unit, this is two rupees per kilometre, which is good going. A normal car may take six litres of petrol, which can cost Rs 500, leading to a fuel cost of five rupees per kilometre. The economy comes from the fact that an electric motor can convert electric energy to drive the car with about 60 per cent efficiency, against not more than 20 per cent of chemical energy of fuel by a petrol engine. Electric cars also make use of regenerative braking, which recovers some of the energy used to speed up. And then there is the pricing of electricity and petrol. One negative that is mentioned is that electric cars need to plug in for a few hours to be recharged, but this may not matter as the cars can go well over 100 km on a full charge.

Electric cars were first priced very high because of the cost of the Lithium-ion rechargeable battery, but costs have come down and, with incentives that the government offers to promote these vehicles, their use has become attractive, even economical. And the government cites the reduction of the imports of petroleum as another ground to support the increased use of electric cars.

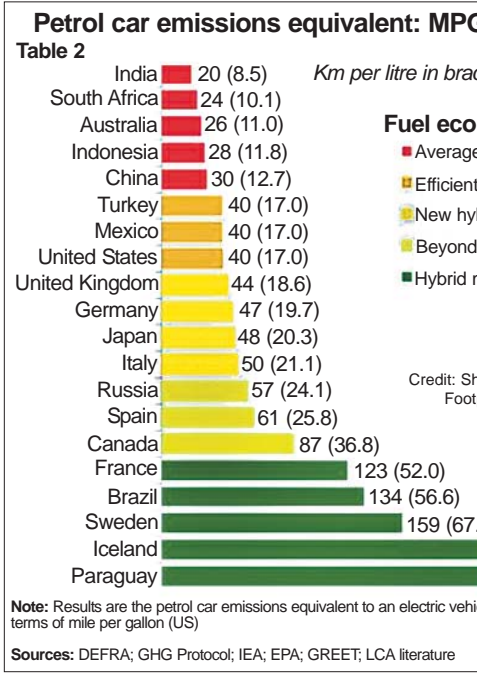
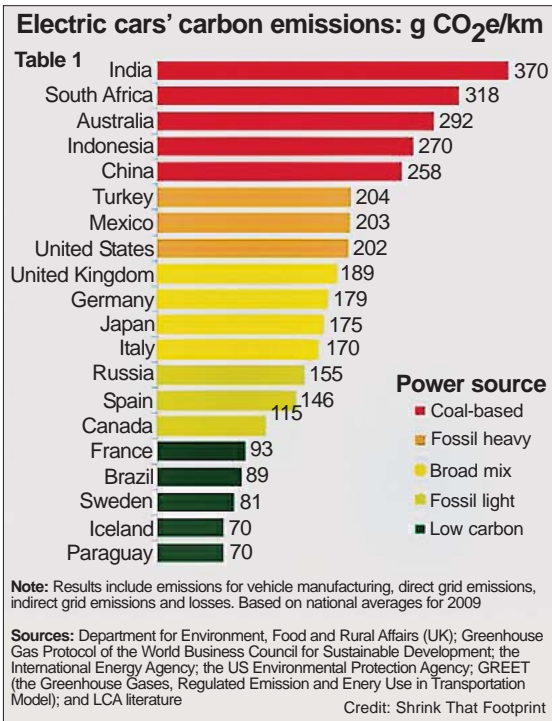
Environment cost

A more important reason to use electric cars, however, seems to be the impression that, unlike petrol- or diesel-driven vehicles, these are non-polluting. Whether this is true, of course, depends on the environmental cost of the electricity that is used. This is where countries like India, a large part of whose electricity generation is based on coal, would lose out. An independent research group that calls itself "Shrink That Footprint", which provides information and seeks to help people who are interested in reducing their climate impact, has published authoritative data of the carbon impact of each kilometre of electric car use, depending on the country where the electricity is drawn.

We can see from Table 1 that the carbon impact of an electric car running for one kilometre, in countries where electricity is predominantly coal-based, as in India, South Africa, Australia, Indonesia and China, is more than twice that in a great many developed countries. The high emission figures against India may be because of the poor quality of coal and also our very high transmission losses. While the figures are of 2009 and there has been growth in renewable energy sources in the USA and Europe and many parts of the world, in India the growth in coal-based power has kept pace with the growth in renewables (Table 3).

Year	Coal/Oil based	Renewable sources
	(in MW)	
1997	61,010	22,560
2001	74,429	27,897
2007	86,015	42,414
2012	131,603	63,493
2014	168,255	72,224
2015	186,698	77,044

Another 84,000 MW of thermal capacity are planned to be added during the two years till March 2017



Electric cars have become feasible with the development of improved storage batteries and are being promoted in many parts of the world as a green option. While there are benefits of lower fuel costs and reduced emissions, compared to petrol- or diesel-driven vehicles, the heavy price tag, which used to be a major disincentive, has been getting progressively lighter. A question, however, is whether the benefits in respect of damage to the environment are actually there, even when electric cars are used in India. One major benefit of electric cars is the fuel economy. An electric car consumes less than 20

PLUS POINTS

Inherent risks

Parents have been warned that giving children paracetamol-based medicines such as Calpol and Disprol too often could lead to serious health issues.



London, Alastair Sutcliffe, said parents were overusing paracetamol to treat mild fevers. As a result, the risk of developing asthma, as well as kidney, heart and liver damage is heightened, according to the *Sunday Times*.

Sutcliffe said, "Parents are using paracetamol too permissively. They seem to fear fever as an illness, per se, which it is not. There is evidence that the excess usage of paracetamol is associated with increased rates of asthma, increased rates of liver damage, but less widely known, kidney and heart damage."

The Royal Pharmaceutical Society, which backs Sutcliffe, said parents needed to be better educated about when to give children paracetamol-based medicines. The Royal College of Paediatrics and Child Health also supports his statement. Steve Tomlin, pharmacist and spokesperson for the RPS, said a common mistake was continuously using the painkiller at high doses.

"Children often go from one care setting to another — with the grandparents, or school — and the chances of them getting extra doses might be quite high," he said. "You only need two or three days giving an extra dose or two above what is recommended and it is not such a safe drug and can start hitting the liver."

KATE NG/THE INDEPENDENT

Land rights

The LandMark map, launched on 10 November in Washington, DC, shows which lands are held by indigenous people and local communities. This is a global effort to gather and publish data on



traditionally used and combat deforestation.

The map, however, is far from complete, according to the Rights and Resources Initiative, a US-based advocacy coalition and one of 13 organisations running the map. The partners hope that, as new data and features are added, the map will yield international benefits — for example by holding logging and mining companies to account over the lands they prospect in.

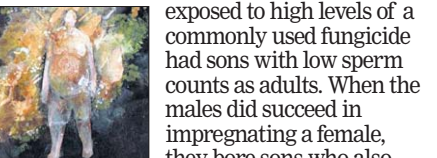
The map shows that around 65 per cent of the world's land is informally tended by indigenous people, yet only 10 per cent legally belongs to such groups. This may be because national governments do not recognise informal land arrangements, the law may not allow formal recognition or the indigenous tenants might not know that they can legalise their use, the map's curators say.

Even when land ownership is legally recognised, boundaries may not be publicly known or enforced, making the land vulnerable to encroachment, the map's partners say.

SCIDEV.NET

Obesogens

Low doses of environmental chemicals can make animals gain weight. Whether they do the same to humans is a thorny issue. In 2005, Mike Skinner's group at Washington State University published a disturbing observation: pregnant rats



exposed to high levels of a commonly used fungicide had sons with low sperm counts as adults. When the males did succeed in impregnating a female, they bore sons who also

had fewer sperm, and the gametes were less viable. The problem perpetuated through multiple generations, as Skinner's lab observed the rats over several years. To see if other environmental chemicals could have the same effect, they screened a host of potentially toxic chemicals: jet fuel, plastics ingredients and more pesticides. Again, exposed animals had offspring with reproductive problems, which were passed down for generations. The researchers also saw another phenotype pop up again and again: obesity. The results were interesting, but not particularly striking to Skinner — until his team tested DDT, a pesticide used widely in the USA before it was banned in the 1970s because of its impact on bird populations and concerns that it could harm human health.

Skinner is quick to point out there is no direct evidence that ancestral pesticide exposures cause weight gain in future generations of humans. But the idea that chemicals in the environment conspire to make us susceptible to obesity is gaining traction. In the past decade, researchers have identified dozens of chemicals that can cause obesity in animals or metabolic disruption at the cellular level. And observational studies in humans have suggested a link between environmental chemical exposures and greater Body Mass Index.

KERRY GRENS/THE SCIENTIST

NEW LIGHT ON A RELIGIOUS REVOLUTION

A LEADING EGYPTOLOGIST BELIEVES TUTANKHAMUN'S GOLD MASK WAS MADE FOR HIS MOTHER, NEFERTITI, AND RADAR EVIDENCE POINTS TO THE LIKELIHOOD OF HER TOMB LYING IN THE SAME COMPLEX, WRITES DAVID KEYES

Ancient Egypt's most iconic treasure — the great golden face mask of the pharaoh Tutankhamun — was a second-hand family hand-me-down, with new research by British Egyptologist Nicholas Reeves revealing that it was originally made for a female pharaoh, probably the famously beautiful ancient Egyptian queen, normally known to the public today as Nefertiti.

The discovery sheds fascinating additional light on some of ancient Egypt's most important but least well understood historical events — a religious revolution and counter-revolution that convulsed much of society some 3,350 years ago. The episode has broad historical importance because it was arguably the very first attempt anywhere in the world to establish a monotheistic religious system. After just a few years, it failed — but perhaps significantly the Jewish Egyptian-associated prophet Moses and the Exodus are traditionally dated to a broadly similar era.

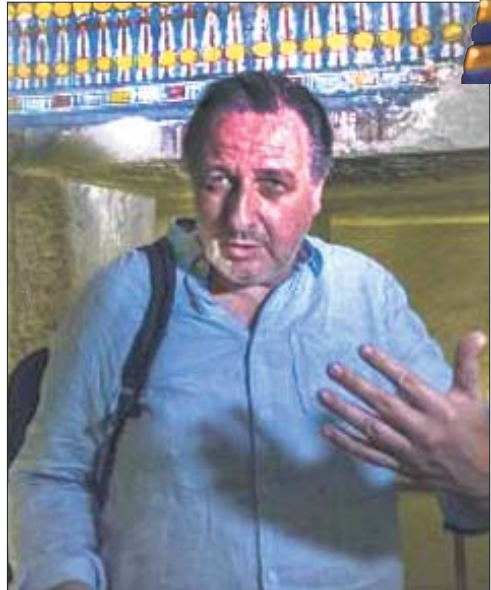
Nefertiti (translated as "the Beautiful Woman Has Arrived") — the newly-revealed probably original "owner" of King Tutankhamun's famous golden death mask — was the wife of the monotheistic revolution's leader, the Egyptian pharaoh Akhenaten ("the Incarnation of the Disk of the Sun"). But she was also probably the co-architect of that short-lived ancient religious reformation — the top-down imposition of the worship of the disk (or "Aton") of the sun, probably symbolising the essence, energy and power of the Sun God.

The evidence that Dr Reeves has found, suggesting that Tutankhamun's large, elaborate gold death mask was (apart from its personalised facial features) made for his mother (or possibly stepmother), Nefertiti, has come from a detailed re-examination of an inscription on the artefact assigning it to Tutankhamun. Very careful examination of the hieroglyphic text shows that the king's names were actually inscribed over an earlier individual's names that appear to have given the full official nomenclature used by Nefertiti after she had become co-pharaoh of Egypt — namely *Ankhkheperure-Meryt-Neferkheperure Neferneferuaten* (literally meaning "Living Manifestation of the Sun God, Beloved of Akhenaten, Beauty of Beauties of the Disk of the Sun").

Interestingly, the second-hand gold mask completes a wider picture in which many of the major other treasures in Tutankhamun's tomb (including his "middle" coffin, miniature gold coffins for his internal organs, a gold breast ornament, some of the gold bands that adorned his mummified body and a gilded statuette) had all been made initially for other ancient Egyptian royals.

Thanks to Dr Reeves' research, Tutankhamun's golden death mask has become part and parcel of one of Egypt's greatest unsolved mysteries — where was Queen Nefertiti buried? Despite more than a century of searching, her tomb has never been found. However, earlier this year, Dr Reeves threw the Egyptological world into some excitement by suggesting that there might be as yet undiscovered secret chambers within Tutankhamun's burial complex. He even raised the possibility that one could be Nefertiti's lost tomb.

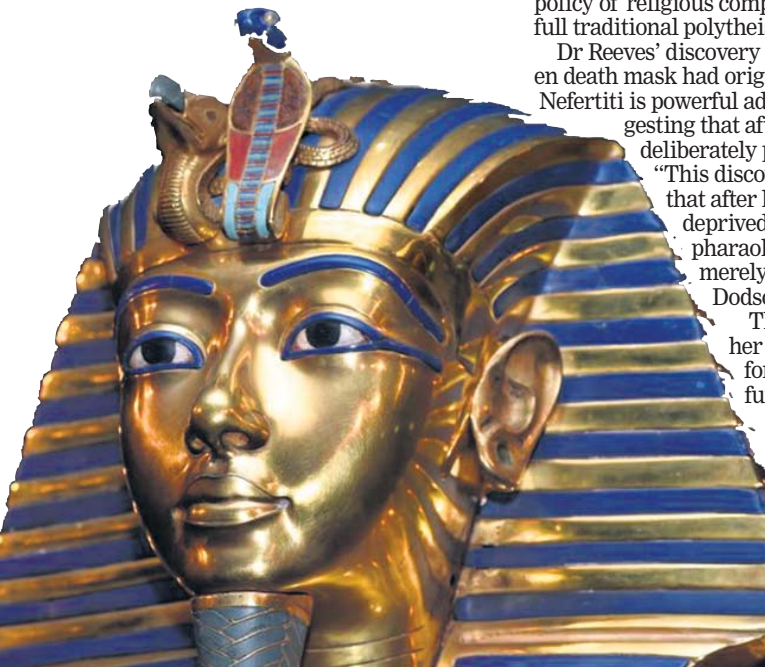
Recently, therefore, the Egyptian government started carrying out a detailed geophysical survey of the wall of Tutankhamun tomb — and



British Egyptologist Nicholas Reeves.

has so far found several anomalies? that it suspects may represent a hidden chamber. Many Egyptologists suspect that Nefertiti's lost tomb may be lurking under a mountain immediately opposite Tutankhamun's tomb — so the newly detected probable additional chamber in Tutankhamun's complex could well contain previously unsuspected additional treasures. But Dr Reeves' discovery of the hidden inscription on Tutankhamun's golden mask itself is raising other questions.

Why was Nefertiti "robbed" of her mask — and, when and why was it given to her son, Tutankhamun. The answer probably lies in the difficult political situation that occurred during the collapse of the monotheistic experiment. A decade after Akhenaten and Nefertiti had launched their religious revolution, some evidence suggests that Egypt may have been hit by a



Hieroglyphics on Tutankhamun's mask appear to have been inscribed on top of earlier writing.

terrible epidemic. Desperate to ensure the continuation of his new monotheistic religion, and perhaps fearful of death, Akhenaten decided to appoint Nefertiti as co-ruler. He did so just in the nick of time — for within a few months he did, indeed, die. His young eight-year-old son, Tutankhamun (at that stage called Tutankhaten), became pharaoh and Nefertiti (now only using her new longer pharaonic name) continued as co-ruler with him, according to a leading historian of the period, Dr Aidan Dodson of the University of Bristol, author of two major books on the era — *Amarna Sunrise* and *Amarna Sunset*.

For three years Nefertiti seems to have tried to find a middle way between the old polytheistic system and the new monotheistic one. But then she, too, died. She had made elaborate preparations for her own death and had expected to be buried as a full pharaoh of Egypt (complete with her pharaonic gold death mask). But after her death, two religiously traditional generals effectively seized power, using Nefertiti's son Tutankhamun as a puppet pharaoh. They appear to have been determined to abandon Nefertiti's

policy of religious compromise and to return to full traditional polytheism.

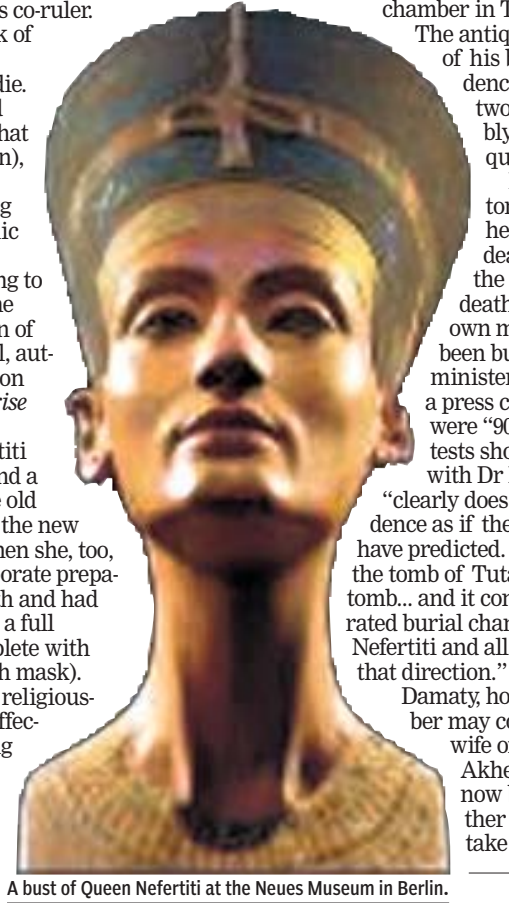
Dr Reeves' discovery that Tutankhamun golden death mask had originally been made for Nefertiti is powerful additional evidence suggesting that after her death she was deliberately politically downgraded. "This discovery re-enforces the view that after her death she was deprived of her status as a pharaoh and presumably buried merely as a queen," said Dr Dodson.

The new evidence suggests her death mask was, therefore, never used in her funeral or in her tomb but was instead put in storage and eventually recycled for Tutankhamun. The latter's golden mask — currently thought of as a mainly art-historical object — is now, therefore, likely to also become a symbol of the world's first known major ideological struggle between monotheism and polytheism.

In Nefertiti's case, Egyptian officials say they are now "90 per cent sure" there is a hidden chamber in Tutankhamun's tomb.

The antiquities ministry says scans of his burial place provide evidence of a chamber behind two hidden doorways, possibly the resting place of the queen. Dr Reeves believes the tomb was initially built for her, but Tutankhamun's death forced priests to open the tomb 10 years after her death as the young pharaoh's own mausoleum had not yet been built. Egyptian antiquities minister Mamduh al-Damati told a press conference that experts were "90 per cent sure" the radar tests showed a hidden chamber, with Dr Reeves confirming that it "clearly does look from the radar evidence as if the tomb continues, as I have predicted. It does look indeed as if the tomb of Tutankhamun is a corridor tomb... and it continues beyond the decorated burial chamber. I think it is Nefertiti and all the evidence points in that direction."

Damati, however, believes the chamber may contain the body of Kiya, a wife of the pharaoh Akhenaten. The scans will now be sent to Japan for further analysis — which could take up to a month.



A bust of Queen Nefertiti at the Neues Museum in Berlin.

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