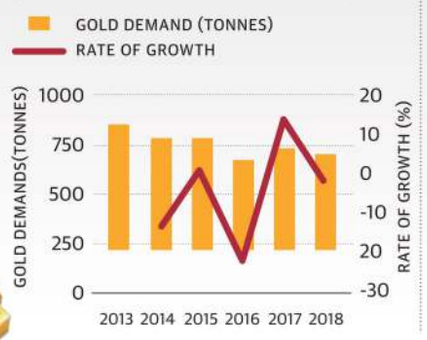
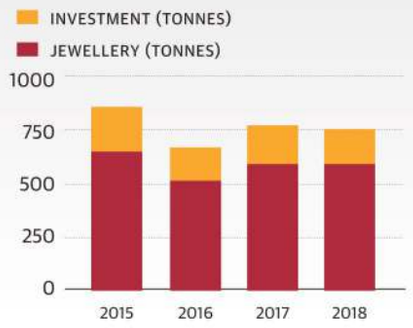
Gold in reserve

Demand for gold has been dropping in India. However, the Reserve Bank has recently increased the gold holdings in its reserves. The last time it added substantially to its holdings was in 2009. By **Varun B. Krishnan**

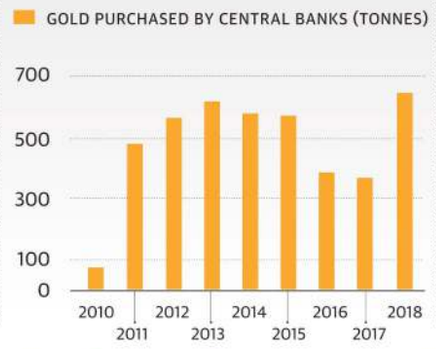
DEMAND DIP
India's consumer demand for gold dipped by 21% in 2018 compared to 2013. Since 2015, there has been a downward trend following govt. measures to promote transparency



LION'S SHARE
Gold for jewellery remains a steady component and accounts for over three-fourth of India's total demand, while gold as an investment makes up the rest



BANKS BUY MORE
Globally, gold purchases by central banks were at their highest level in 50 years. The trend shows that the increase in demand was higher in 2018 compared to 2016 and 2017



FOLLOWING SUIT
Since 2009, RBI's gold reserves have increased gradually, spiking after the first quarter of 2018. The central bank's recent increase in gold-buying is in line with many other central banks worldwide

74%
Year-on-year growth in gold-buying by central banks and other institutions (2017 to 2018)

Data updated in February 2019 | Source: World Gold Council | Graphic:* **L. Balamurugan

India's electric vehicle success story will ride on two wheels

Adoption of electric two-wheelers will need cheaper lithium-ion batteries, increasing charging speed and improving charging infrastructure

SHASHANK SRIPAD
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The year 2018 was the year for electrics. Cumulative electric vehicles (EVs) on road crossed the four million-mark and the Tesla Model 3 became the best-selling premium vehicle, delivering over 1,40,000 vehicles in the year. According to the latest Global Electric Vehicle Outlook published by the International Energy Agency, China has around 250 million electric two-wheelers, with annual sales of 30 million.

This progress appears extremely promising as there are close to a billion two-wheelers in circulation in the Association of Southeast Asian Nations, China and India.

However, electric two-wheeler adoption is almost exclusively limited to China. Amidst all of this, there is an even more impressive story, one that is not often told.

As highlighted in an article by Akshat Rathi in *Quartz*, of the total carbon dioxide emissions saved by EVs worldwide, over 80% was due to China's electric two-wheelers alone. This raises an interesting question of what makes China different from its neighbouring countries in Asia.

Two factors are highlighted for this success story in China namely: electric two-wheelers were designated as bicycles, exempting them from registration and requiring a driving licence; and, cities placed severe limitations on the use of petrol two-wheelers in the city centres. In order to write an EV success story for India, it is very important to electrify two-wheelers, which are about

> **The electric scooter is around four to six times more efficient than a petrol scooter**

three-fourths of the transportation fleet, as noted by Amitabh Kant, CEO, NITI Aayog. He also detailed that by electrifying all the two-wheelers in use, India can avoid about 15% of the total transportation emission and more importantly, about 30% of particulate matter, curbing air pollution.

This raises the question of what makes it so difficult to make an electric two-wheeler competitive with petrol vehicles. In order to answer this question, we first go back to some high school physics.

To move an object, such as a vehicle and propel it forward, the propelling force must overcome the opposing forces. In a vehicle, the propelling force is powered by the energy source which could be petrol, diesel, natural gas (CNG) or electricity within a device like an engine or a motor. There are four kinds of opposing forces acting on a vehicle, the first is air drag – the force exerted by air when a biker is zipping through on a motorcycle.

The second is friction, between the tyres and the road, which wears the tyres out over time. The third is overcoming gravity while travelling on a road gradient, the force required to go up an inclined road. The last is the force required to overcome inertia, which keeps objects at rest or in motion unless a force acts on them, so the vehicle will remain at rest unless a part of the propelling force pushes it forward.

In the real world, a conventional scooter's "mileage" is about 50-70 km for a litre of petrol, which can be interpreted to be about 135-190 watt-hours for every kilometre (1000 watt-hours is one unit in a monthly electricity bill).

> **By electrifying all the two-wheelers, India can avoid about 15% of the total transportation emission**

On the other hand, if the same scooter is electric, then it would need about 25-40 watt-hours (equivalent to running a modern LED tube-light for about two hours). The electric scooter is around four to six times more efficient than a petrol scooter. The electric scooters are able to accomplish this because they have two things that are in their favour, viz. batteries and electric motors are much more efficient than petrol engines and, electric scooters have a trick up their sleeve called regenerative braking. Regenerative braking allows running the motors in 'reverse', storing energy back into the battery pack while decelerating.

Cost per km

For the price conscious Indian, it is important to quantify how much this translates to in cost per km of driving. A litre of petrol costs about ₹70 and the conventional scooter operates at about ₹70-₹100 per 100 km. For an electric two-wheeler, with an electricity price of around ₹3-6 per unit, it would cost about ₹10-₹30 per 100 km, which is significantly lower. *Bloomberg New Energy Finance* estimates that the total cost of owning and operating electric two-wheelers in 2020 would be about ₹2 per km which is on par with petrol vehicles.

And, these estimates for electric two-wheelers drop to about ₹1.5 or lower per km by 2025 while their petrol counterparts would continue to cost the same.

This is the rosy side of the story. However, if the electric scooter needs to have a range of 100 km, it needs about three kilo-watt hours in its energy source. The energy source in all modern electric vehicles is lithium-ion batteries. These batteries are the preferred energy source as they are compact both in size and weight, an important consideration for vehicles. This comes at a cost.

Expensive batteries

Lithium-ion batteries cost over ₹10,000 for every kilo-watt hour. This means that for a 100-km electric two-wheeler, the battery cost itself will be around ₹40,000-50,000, which is close to the average retail price of petrol two-wheelers today. A second challenge remains which is to related to "re-filling" the tank of an electric scooter. This requires an electric scooter's battery to be charged and this can take of the order of an hour or more today. The slow charging time of Li-ion batteries remains a frustration for many cell phone users and the same issue persists for electric scooters. Li-ion batteries today cannot be charged safely at faster rates.

The final question is where one should go to charge an electric scooter. Charging infrastructure is sparse today but there is a strong commitment to improving this. An open question remains on where to strategically place the chargers such that it can lead to widespread use and adoption.

One bright spot within all of this is that it is possible to charge an electric scooter at home with a conventional plug outlet in a couple of hours.

In the recent Interim Budget of 2019, the then Finance Minister Piyush Goyal stressed on the need to switch to EVs powered by renewables to reduce oil imports and combat climate change. The electrification success story in India hinges on electrifying two-wheelers which will require lowering costs of Li-ion batteries, increasing charging speed and improving the charging infrastructure.

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