Five Key Innovations That Can Transform India

- *Amitabh Kant**

In 1714, the British Empire faced a crippling challenge: ships could not determine longitude at sea. The then British government responded with the Longitude Prize, which spurred breakthroughs like John Harrison's marine chronometer and transformed navigation. As a result of this innovation, the sun never set on the British Empire for the next 200 years. That was the impact of innovation. Centuries later, the United States applied a similar approach when DARPA (Defence Advanced Research Projects Agency) catalysed the creation of technologies like the internet, GPS, and autonomous vehicles by backing innovators and acting as the first big buyer. The lesson is clear: when governments set bold problems and back solutions at scale, they unlock innovations that reshape nations.

Today, India faces its own innovation gap. Despite a thriving startup ecosystem and an enviable demographic dividend, we lag in producing transformative technologies. We file patents but do not commercialise them. In 2023, India paid $14.3 billion in IPR outflows but earned only $1.5 billion in receipts, a recovery rate of just 11%, down from 14% in 2014. Our R&D spend remains 0.65% of GDP, far below South Korea, Israel, or the United States. Research institutions and entrepreneurs operate in silos, limiting the flow of knowledge from lab to market.

The government has recognised this gap and rolled out ambitious initiatives. The Rs. 1 lakh crore *Anusandhan* National Research Fund supports basic research and prototypes. The IndiaAI Mission seeks to build leadership in artificial intelligence. A dedicated DeepTech Fund of Funds will pool capital for risky but transformative startups. These measures are vital first steps, but to truly transform India's innovation landscape, we must do more.

India is at the cusp of the largest infrastructure build-out anywhere in the world. Our ambition to grow from a $4 trillion to a $30+ trillion economy by 2047 cannot be met through incrementalism. Instead, we need to spotlight national innovations, nation-scale problems whose solutions can catapult India into global leadership. And unlike in the past, we now have a powerful new tool: artificial intelligence and machine learning, powered by vast Indian datasets. What was not possible yesterday is possible today.

These innovations must be bold, time-bound, and designed to tackle the problems that hold India back every single day:

1. **Sewage Free India:** Untreated sewage is India's single most significant source of water pollution, contaminating rivers, groundwater, and impacting public health. We need an innovative device to convert waste into safe manure, biogas, and clean water. We can dramatically cut water-borne diseases while keeping the household cost of the device to just Rs. 25,000.

2. **Safe Water for Millions:** As of mid-2025, 81% of rural households have tap water connections under the *Jal Jeevan Mission*. We must invent a low-cost spectrometer that measures TDS, heavy metals, nitrates, phosphates, and microbial indicators, records results in structured datasets, and leverages AI to monitor and predict water quality. This will be the next step in making clean water available for all at just Rs. 4 per 20 litres per family.

3. **Light Green Battery:** India's clean energy transition is hampered by dependence on battery imports. We must build a durable battery for both mobility and energy storage. It must be designed around minerals available in India, or in abundance globally, that double battery life and drive clean energy adoption.

4. **Smart Agriculture:** Millions of Indian farmers remain vulnerable to rainfall variability, soil degradation, and market unpredictability. Every single Indian farmer must be provided with precise advice on their mobile app, which integrates soil, water, weather, and price data and connects them to real-time markets to enable them to get the best returns.

5. **120 Day Flyovers/Underpasses:** Infrastructure delays choke our cities, increase costs, and slow growth. We must complete flyovers and tunnels within 120 days, 60 days of designing and planning, 30 days of preparation, and 30 days of rapid construction, cutting costs by 30% and transforming urban mobility.

These are not utopian ideas. They are practical, high-impact areas where Indian innovators can deliver globally competitive solutions- if given the right push. For such innovations to succeed, we need three things:

- *First*, political and administrative will. Just as digital public infrastructure, bank account opening, and digital payments were driven with relentless focus, these innovations require top-level ownership. A single empowered agency should curate the problems, provide mentorship, track delivery, and procure technology.

- *Second*, government procurement reform. India's innovators need scale to thrive. The government must consolidate demand and become the first buyer of technology. Committing substantial outlays for successful technologies, ensuring updated codes

and procurement norms will truly ensure 'Make in India' for these products. Government being the first buyer is critical.

- *Third,* a pro-innovator ecosystem. We must throw open these problems to the world to find solutions. Consortia must be Indian-headquartered, with a majority Indian ownership and manufacturing. This ensures that when we solve national problems, the value accrues to Indian companies and workers, not foreign intermediaries. Export incentives and global positioning can then ensure our innovations spread worldwide.

If India embraces this model, the payoff will be transformative. Just as the Longitude Prize shaped Britain's naval supremacy, and DARPA made the U.S. a technology superpower, national innovations can turn India into a hub of problem-solving innovation.

But the impact will not stop at our borders. The Global South, home to over five billion people, faces the same challenges: sewage, water, energy, agriculture productivity and speedy infrastructure development. Western nations have largely lost the capacity for mass-scale infrastructure building; India still has it. If we pioneer low-cost, scalable solutions to these common problems, others will follow. In doing so, India can become not just an economic leader, but also a model for inclusive innovation across the developing world.

This is not charity. It is strategy. By solving our problems, we solve theirs. And by leading the Global South into a new era of innovation, we also ensure that India's growth is resilient, competitive, and globally relevant. We must now throw open the challenge of change to our innovators-set bold targets, back them with resources, and give them the freedom to think differently, even to fail. This is how we will build an innovative India. This is how India will leapfrog into the future. This is how we change not only India, but the world.

The author was India's G20 Sherpa and is the former CEO of NITI Aayog.