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The Long March Ahead to Technological Independence

Context

- On August 15, 2025, India celebrated its **79th Independence Day**, commemorating the nation's hard-won political freedom.
- Yet, in today's interconnected and digitised world, **true independence extends beyond political autonomy.**
- It now **encompasses technological sovereignty, the ability to control and trust the digital systems** that shape nearly every aspect of national life and without it, India risks replacing one form of dependence with another.

The New Battleground of Geopolitics

- The nature of global conflict has transformed and **Modern wars are no longer fought primarily with bullets and bombs**, but with software, drones, and cyberweapons.
- The **most insidious battleground today is cyberspace**, where banks, transportation networks, and power grids rely heavily on information and communication technology.
- A **troubling reality emerges from this reliance**: most of these critical systems are designed and controlled by a handful of foreign corporations, often concentrated in a single country.
- This **dependence constitutes a grave national vulnerability** and If these companies were ever compelled by their governments, or motivated by malice, **to cut off access to cloud services or artificial intelligence tools**, the consequences for India could be catastrophic.
- **Such scenarios are not mere hypotheticals**; recent disruptions of cloud services to a company illustrate the tangible risks of overreliance on external providers.

The Road to Technological Sovereignty for India

- **Building the Foundations of Autonomy**
 - The **solution lies in pursuing technological autonomy**. Currently, India does not possess indigenous operating systems, databases, or foundational software infrastructure it can fully trust.
 - This **dependence on external sources places the nation at risk**. However, the path forward is neither impossible nor uncharted.

- **Open-source software offers a powerful framework** for building secure, transparent, and reliable alternatives.
- By developing customised versions of Linux and Android, **India could create systems free of hidden vulnerabilities.**
- The **challenge, however, is not just initial development but long-term maintenance** and support.
- For such software to thrive, **it requires a robust user base and a community of dedicated professionals** committed to constant updates and innovation.
- This is **not a task for a single institution.** Rather, it is a collective mission for India's vast pool of IT professionals.
- If the country's technology community can unite behind this cause, **they can overcome dependency and shape a sovereign digital future.**

• The Harder Road: Hardware Sovereignty

- While software sovereignty is challenging, **achieving hardware independence poses an even greater test.**
- **Semiconductor fabrication demands enormous investment,** technical expertise, and enduring commitment.
- **Few nations possess fully self-reliant capabilities in this sector.** India, therefore, must approach this journey strategically, by focusing on chip design, partnerships in manufacturing, and gradually building expertise in assembly and supply chain management.
- **Outsourcing fabrication in the short term is pragmatic,** but it must be coupled with long-term investments to reduce reliance.
- **India's political independence was won through non-violence;** its technological independence can be pursued through collaboration and open-source innovation.
- This **quest is not about opposing others, but about ensuring self-reliance** in critical systems.

• A Social and Economic Movement

- The open-source movement, once a vibrant socio-political force, has lost some of its momentum in recent years.
- Although much of today's software, including Android, Linux, and Hadoop, is open-source, the real control often rests with centralised cloud services and data centres abroad.
- **What India needs is a renewed social movement,** one that rallies both professionals and ordinary citizens behind the goal of technological autonomy.
- **Private companies and individuals now share the concerns once confined to strategic sectors:** the risk of dependency on external powers.
- People already contribute financially to free and open-source software, whether directly or indirectly.
- Redirecting these resources toward trusted, **homegrown software is a small but crucial step.**

The Way Forward

- To turn this vision into reality, **India must establish a mission-oriented program** focused on implementation rather than research.
- This **mission would assemble strong engineering** and project management teams to develop and maintain essential digital infrastructure.
- **Priority areas include both client-side software (databases, email clients, calendars) and server-side components** (web servers, email servers, cloud systems).
- Crucially, **this mission must be designed as self-sustaining, supported by viable business models** rather than perpetual reliance on government funding.
- **The government's role should be that of an enabler**, helping establish the initial framework while ensuring long-term independence from state or corporate control.

Conclusion

- India stands at a pivotal moment and **the risks of dependence on external technologies are clear**, and the resources to chart a sovereign path are within reach.
- What is required is **collective will, a recognition that technological independence is not a luxury, but a necessity** for national security, economic resilience, and genuine freedom.
- The **long march toward technological sovereignty will be neither quick nor easy**, yet, as India's history has shown, the pursuit of independence, political or technological, is always worth the struggle.

The Long March Ahead to Technological Independence FAQs

Q1. Why does India need technological sovereignty in addition to political freedom?

Ans. India needs technological sovereignty because modern life and national security depend on digital systems that are currently controlled by foreign companies.

Q2. What role can open-source software play in India's technological independence?

Ans. Open-source software allows India to build secure, transparent, and customisable systems free from external control or hidden vulnerabilities.

Q3. Why is hardware sovereignty considered more difficult than software sovereignty?

Ans. Hardware sovereignty is harder because semiconductor fabrication requires huge investments, advanced expertise, and long-term commitment.

Q4. What kind of mission does India need to achieve technological autonomy?

Ans. India needs a mission focused on implementation, with strong engineering teams and self-sustaining business models rather than dependence on government funding.

Q5. What is the immediate step India must take to reduce its dependence on external technologies?

Ans. The immediate step is to assemble teams to develop and maintain essential open-source software for both client-side and server-side systems.

Source: [The Hindu](#)

India-EFTA Trade and Economic Partnership Agreement (TEPA) - A Strategic Leap Forward

Context:

- India and the European **Free Trade Association** (EFTA) — comprising **Switzerland, Norway, Iceland, and Liechtenstein** — have signed the Trade and Economic Partnership Agreement (TEPA).
- This is **India's first comprehensive trade pact** with **developed European economies**, marking a significant step in India's global trade diplomacy.

Key Features of TEPA:

- **Investment and job creation:**
 - **EFTA pledge:** In an unprecedented commitment, the pledge is **to promote investment of about \$100 billion over 15 years in India** and facilitate up to 1 million direct jobs.
 - **Positions India** as an **attractive destination** for long-term investment.
- **Market access and tariff reductions:**
 - EFTA countries have agreed to eliminate or reduce tariffs on **2%** of tariff lines, representing **99.6%** of India's exports by value and to provide duty-free treatment for all non-agricultural products.
 - **Boost to sectors:** Textiles, gems and jewellery, organic chemicals, industrial goods.
 - **Service sector gains:** Commitments across 128 sub-sectors from Switzerland, 114 (Norway), 110 (Iceland), 107 (Liechtenstein).

Strategic and Technological Collaborations:

- **Alignment with India's priorities:**
 - **EFTA strengths:** Precision engineering, pharmaceuticals, health sciences, renewable energy, frontier technologies.
 - **Opportunities for India:**
 - With its **skilled talent pool**, India can not only absorb these technologies but also adapt, scale, and innovate them to meet the demands of its domestic market and beyond.
 - This will support **Atmanirbhar Bharat and Make in India**
 - **Climate and energy transition:**
 - **India's goals:** Net Zero by 2070 and 500 GW renewable capacity by 2030.
 - **TEPA opens doors for** European green finance, technology partnerships, and capital for sustainability projects.
 - **Nuclear energy and thorium advantage:**

- India has **achieved 50% of its installed electricity capacity from non-fossil fuel sources** (Total – 243 GW, including 116 GW of solar, 52 GW of wind, and nearly 50 GW of hydro power).
- Though this is **5 years ahead** of the target (under NDCs to the Paris Agreement), the **challenge remains of ensuring a stable baseload power** source to complement the renewables which work intermittently.
- This is where **nuclear energy presents a compelling solution**.
- As India has approximately **25%** of the world's thorium reserves, there is the **potential to develop thorium-based nuclear energy**, which is safe, clean, and proliferation-resistant.
- TEPA may help access **EU Sustainable Finance Taxonomy funds** for **thorium pilot projects**.
- **Collaboration with Norway's** thorium research ecosystem could accelerate **India's three-stage nuclear programme**.

Economic and Diplomatic Significance:

- **Immediate benefits:** Export promotion, services sector expansion, consumer choices.
- **Long-term benefits:** Energy security, technology transfers, resilience in supply chains.
- **Strengthens:** India's position as a trusted global partner and services hub.
- **Symbolises:** India's confident, assertive economic diplomacy aligned with Viksit Bharat 2047 vision.

Conclusion:

- TEPA is **more than a trade deal**. It is a **strategic partnership framework** combining trade, investment, technology, and sustainability.
- By leveraging European capital and expertise with India's demographic and resource strengths, TEPA sets a **new benchmark for global cooperation**.
- It paves the way for an **energy-secure, innovation-driven, and climate-resilient India**, aligning domestic aspirations with global commitments.

India-EFTA Trade and Economic Partnership Agreement (TEPA) FAQs

Q1. What is the significance of the TEPA signed between India and the European Free Trade Association (EFTA)?

Ans. TEPA is India's first comprehensive trade pact with developed European economies, ensuring \$100 billion investment, 1 million jobs, and enhanced market access.

Q2. How does TEPA align with India's vision of Atmanirbhar Bharat and Make in India?

Ans. TEPA fosters technology transfer, investment, and strategic collaborations, enabling India to scale domestic manufacturing and services while strengthening global competitiveness.

Q3. In what way can TEPA contribute to India's climate commitments and Net Zero target by 2070?

Ans. TEPA facilitates access to European green finance, renewable energy technologies, and sustainability-linked capital, supporting India's 500 GW renewable energy target by 2030.

Q4. Why is thorium considered a strategic advantage for India's future energy security under TEPA?

Ans. With nearly 25% of global thorium reserves, India can leverage TEPA for collaborative research and green finance to advance safe, clean, and proliferation-resistant nuclear energy.

Q5. How does TEPA reflect India's evolving approach to global economic diplomacy?

Ans. TEPA showcases India's confident, equal-term negotiations with advanced economies, focusing on trade, technology, and sustainability, in line with its Viksit Bharat 2047 vision.

Source: IE

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