

Advanced Materials Roadmap

OVERALL STRATEGIES

Needs for Government Facilities and Lab

- Continuous support for ADMATEL and PATHS Center

Needs for Human Resources

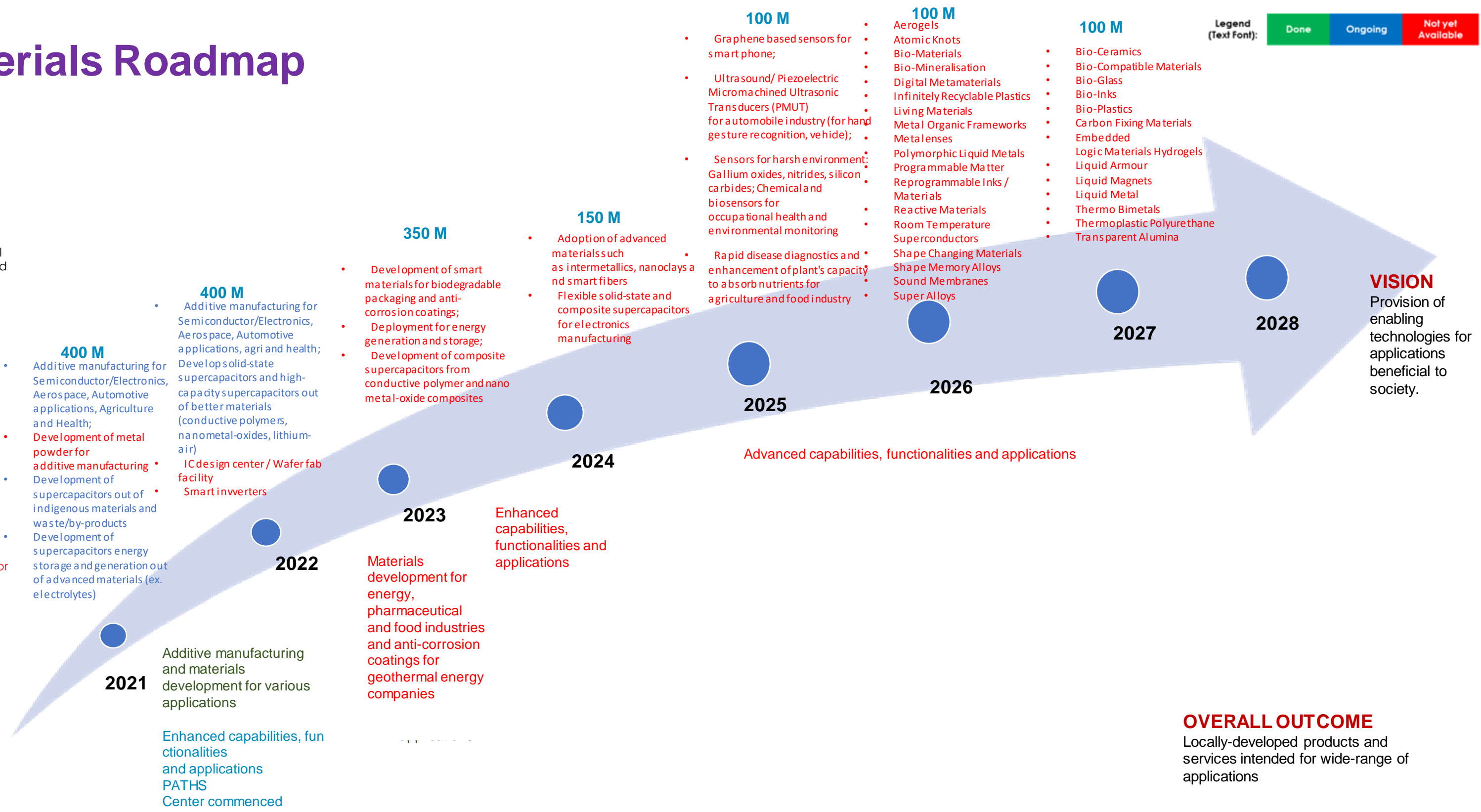
- Increase awareness of Advanced Materials and Nanotechnology in STEM curriculum, and in industry and among consumers
- Send 10 researchers abroad to raise local talent to global standards by providing exposure and training in renowned research laboratories
- Establish programs to obtain visibility into industry needs and open channels for collaboration (e.g. internships, immersions)
- Introduce targeted training electives in Advanced Materials and Nanotechnology to promote employment readiness of graduates for certain industry applications
- Balik Scientist Program to consolidate resources and lead R&D and collaboration efforts in the field (through Advanced Materials and Nanotechnology Hub)
- Improve workforce preparation for opportunities with multinational partners

R&D Program / Project Needs

- Build and publish database with information regarding technology researches, publications, laboratories and equipment, and skills developed
- Partner with at least 10 entities for R&D applications and infrastructure co-development
- Various ongoing R&D projects on Advanced Materials
- PATHS Center R&D Projects (2022-2024):
 - Thermal and Structural Analysis on Semiconductor Packages Using Multiphysics Computational Simulation for Space Applications
 - Computational Design and Fabrication of Multi-functional Packaging for Electronics and Semiconductor Applications
 - Determining the Freshness & Spoilage of Crops Using Smart Metal Oxide Gas Sensors for Supply Chain Applications
- Materials Informatics R&D

S&T Policy Initiatives

- Ensure communication of government policy incentives and benefits to stakeholders



100 M

- Graphene based sensors for smart phone;
- Ultrasound/ Piezoelectric Micromachined Ultrasonic Transducers (PMUT) for a automobile industry (for hand gesture recognition, vehicle);
- Sensors for harsh environment: Gallium oxides, nitrides, silicon carbides; Chemical and biosensors for occupational health and environmental monitoring

100 M

- Aerogels
- Atomic Knots
- Bio-Materials
- Bio-Mineralisation
- Digital Metamaterials
- Infinitely Recyclable Plastics
- Living Materials
- Metal Organic Frameworks
- Metalenses
- Polymorphic Liquid Metals
- Programmable Matter
- Reprogrammable Inks / Materials
- Reactive Materials
- Room Temperature Superconductors
- Shape Changing Materials
- Shape Memory Alloys
- Sound Membranes
- Super Alloys

100 M

- Bio-Ceramics
- Bio-Compatible Materials
- Bio-Glass
- Bio-Inks
- Bio-Plastics
- Carbon Fixing Materials
- Embedded Logic Materials
- Hydrogels
- Liquid Armour
- Liquid Magnets
- Liquid Metal
- Thermo Bimetals
- Thermoplastic Polyurethane
- Transparent Alumina

350 M

- Development of smart materials for biodegradable packaging and anti-corrosion coatings;
- Deployment for energy generation and storage;
- Development of composite supercapacitors from conductive polymer and nano metal-oxide composites

150 M

- Adoption of advanced materials such as intermetallics, nanoclays and smart fibers
- Flexible solid-state and composite supercapacitors for electronics manufacturing
- Rapid disease diagnostics and enhancement of plant's capacity to absorb nutrients for agriculture and food industry

400 M

- Additive manufacturing for Semiconductor/Electronics, Aerospace, Automotive applications, agri and health; Develop solid-state supercapacitors and high-capacity supercapacitors out of better materials (conductive polymers, nanometal-oxides, lithium-air)
- IC design center / Wafer fab facility
- Smart inverters
- Development of metal powder for additive manufacturing
- Development of supercapacitors out of indigenous materials and waste/by-products
- Development of supercapacitors energy storage and generation out of advanced materials (ex. electrolytes)

2027

2028

2025

2026

2024

2023

2022

2021

Advanced capabilities, functionalities and applications

Enhanced capabilities, functionalities and applications

Materials development for energy, pharmaceutical and food industries and anti-corrosion coatings for geothermal energy companies

Additive manufacturing and materials development for various applications

Enhanced capabilities, functionalities and applications
PATHS Center commenced

OVERALL OUTCOME

Locally-developed products and services intended for wide-range of applications

VISION

Provision of enabling technologies for applications beneficial to society.