

Additive Manufacturing Roadmap

Updated as of 16 February 2024

OVERALL STRATEGIES

Needs for Government Facilities and Lab

- Continuous support for AMCen

Needs for Human Resources

- Increase awareness of Additive Manufacturing in STEM curriculum, and in industry and among consumers
- Send 10 researchers abroad to receive 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 Additive Manufacturing 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
- 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

S&T Policy Initiatives

- Ensure communication of government policy incentives and benefits to stakeholders

Legend (Text Font):

Ongoing	Done	Target
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400 M
AMCen Program initialized

240 M
Capacity building of personnel on AM
Collaboration / meeting with other agencies and industry partners

2020
Launching of the Additive Manufacturing Center (AMCen)

75 M
Qualification and evaluation of local materials for AM
Local materials studied, utilized, and developed specifically to suit AM processes
Produced and characterized developed AM materials

2021
Operationalization of AMCen
Development of business models and pricing for its services
Development of Additive Manufacturing Standards
Additive Manufacturing Niche Center initialized

R&D SOLUTIONS

- 75 M**
- Small-scale production; post-processing of printed materials
 - Robust vertical wind turbine design
 - Improved hybrid electric road and train components
 - Muffler dry generator
 - Mechanization (Agriculture)
 - Small satellite parts (polymer, metal)
 - Alignment to SRDP (Defense)
 - Knee system, cementless total hip system
 - Surgical instruments for orthopedic procedures
 - Locally available materials for 3DCP
 - Optimization of properties of different types of materials used in 3DCP

2022
Additive manufacturing and materials development for Manufacturing, Medical, Building, and Consumer 3D

- 430 M**
- Accessible 3D Printers (low-cost for small-scale manufacturers)
 - Materials for ESD (Semiconductor)
 - Policy/paper on AM in Ph
 - Localized metal powder for AM
 - Multiple materials platform for AM
 - Temperature sensors and other basic healthcare devices
 - Patient specific knee implant, spine implant
 - Metal materials for medical ultrasound
 - impedance matching
 - Development of sharing platform for 3DCP
 - Local fibers for bicycle parts and helmet liners

2023
Optimized process for MM-AM, Formulation of raw materials for MM-AM
New MM-AM Process
FEA, materials characterization of AM products, internal inspection (porosity and wall thickness)

2024
Enhanced capabilities functionalities and applications
Equipment vibration testing (STA, automotive, defense, thermal vacuum)

2024
Tissue Engineering
Procurement of latest technology not yet available
Equipment: Outgassing (STA)

- 100 M**
- Database of developed raw materials for AM
 - Prototype products of multiple material AM
 - Raw materials for AM
 - Minimally-invasive surgical devices
 - Database of developed raw materials for 3DCP
 - Inkjet printing for membrane modification (nanofiltration membrane)
 - 3D printing of health food for personalized nutrition
 - Solar water evaporation for clean water production from sea and wastewater for inland and remote communities (porous membranes – polymer, support layer for biomass materials, system)

- 80 M**
- Solar photovoltaic integrated membrane distillation for water purification (active system with pumps using hydrophobic membranes)
 - 3D printed skin for burn patients
 - Upgrading of local printers, laser-based localized printers

- 20 M**
- Inkjet printing for membrane modification (nanofiltration mode)

MILESTONES

2025
Advanced capabilities, functionalities and applications (3D, 4D printing) with Artificial Intelligence (AI)
Policy Development on Environmental and Health Safety on 3D-printed Consumer Products
Additive Manufacturing Niche Center established and operational

2026
Advanced capabilities, functionalities and applications (3D, 4D printing) with Artificial Intelligence (AI)
Policy Development on Environmental and Health Safety on 3D-printed Consumer Products
Additive Manufacturing Niche Center established and operational

2027
Advanced capabilities, functionalities and applications (3D, 4D printing) with Artificial Intelligence (AI)
Policy Development on Environmental and Health Safety on 3D-printed Consumer Products
Additive Manufacturing Niche Center established and operational

2028
Advanced capabilities, functionalities and applications (3D, 4D printing) with Artificial Intelligence (AI)
Policy Development on Environmental and Health Safety on 3D-printed Consumer Products
Additive Manufacturing Niche Center established and operational

- 50 M**
- Actual application of 3DCP in construction projects
 - Conduct of impact study on AM in construction
 - Comparative assessment of 3DCP to traditional and modular construction methods used locally
 - 3D-printed membranes for electrochemical energy systems

OVERALL OUTCOME

Locally-developed products and services intended for Manufacturing, Medical, Building, and Consumer 3D

VISION
Provision of enabling technologies for applications beneficial to society.

50 M

- 3D Holographic Printing
- 3D Bio Printing
- 3D Ultrasonic Printing
- Cold forming
- Screen Printing



List of Additive Manufacturing Projects (for the whole duration of the roadmap)

R&D Technologies	Project Title	Budget Allocation ('000)							Status
		2022	2023	2024	2025	2026	2027	2028	
Additive Manufacturing	Development of Multiple Materials Platform for Additive Manufacturing (MATDEV)	22,016,176.82							Completed (DOST-GIA)
Additive Manufacturing	Research on Advanced Prototyping for Product Innovation and Development using Additive Manufacturing Technologies (RAPPID-ADMATEC)	21,261,171.93							Completed (DOST-GIA)
Additive Manufacturing	Technological Readiness and Innovation Through Advanced Manufacturing in the Philippines (TRIAMPH) under the Central Hub on Additive Manufacturing in the Philippines (CHAMP) Program		56,935,856.00	254,510,856.00	43,435,856.00				Ongoing (DOST-GIA)
Additive Manufacturing	Project 2: Materials for Application-Specific Technologies for 3D/4D Printing R&D (MAST3R) under the Central Hub on Additive Manufacturing in the Philippines (CHAMP) Program		29,817,271.28	51,878,521.25	21,336,021.25				Ongoing (DOST-GIA)



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R&D Technologies	Project Title	Budget Allocation ('000)							Status
		2022	2023	2024	2025	2026	2027	2028	
Additive Manufacturing	Study on the Suitability of Acrylonitrile Styrene Acrylate (ASA) as Material for a 3D-Printed Statue	12,059,726.40							Completed (DOST-GIA)
Additive Manufacturing	3D-BTM: Bio-Fabrication of Bone, Muscle, and Pancreatic Biomimetic Tissue Models for Printable and Injectable Scaffolds	26,696,301.43	7,447,261.57	7,447,261.57					Ongoing (DOST-GIA)
Additive Manufacturing	3D-CBoI: Development and Characterization of 3D-Printed Carrageenan Bolus for Superficial Radiotherapy	5,100,318.19	3,429,945.80	3,537,445.80					Ongoing (DOST-GIA)
Additive Manufacturing	3D-ABi: Development and Performance Evaluation of Biocompatible Materials and Pore Design Structure for 3D Printed Artificial Bone Implants	4,084,764.00	3,061,564.00	3,364,564.00					Ongoing (DOST-GIA)
Additive Manufacturing	Development, Characterization and Performance Evaluation of polymer coated and uncoated Aluminum and Titanium Alloy Powder for Selective Laser Sintering, Selective Laser Melting and Electron Beam Melting		2,781,012.00	2,218,988.00					Ongoing (DOST-GIA)

