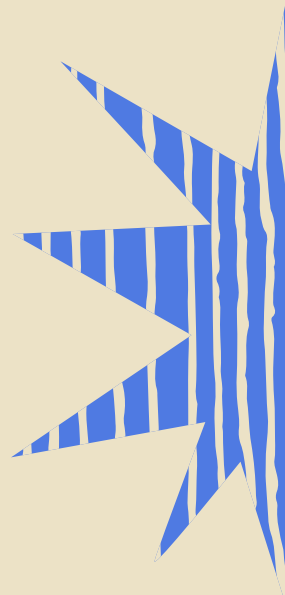


Shaping the Future of Makerspaces
in Africa & Europe

Recommendations for Policy Makers



February 2024

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Common Policy Recommendations

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Executive summary

A makerspace is a place for making things that combine traditional techniques with digital fabrication technologies such as 3D printers, laser cutters and other computer-controlled machines. Makerspaces support education, Science Technology Engineering and Mathematics (STEM) outreach, upskilling, start-ups, prototyping, job creation and community development. They take different forms, such as public, private, university-based, and membership-based. Makerspaces may also be known as 'Fabrication Laboratories' – or FabLabs – TechShops or hackerspaces.

They are often community-based hubs for learning, prototyping, and collaboration, emerging as transformative forces in addressing multifaceted challenges (Cattabriga, 2020), from education and economic development to emergency resilience. These creative spaces redefine learning, champion local production, democratize knowledge and elevate resource access.

The insights provided in this report highlight the significant role that makerspaces play in contemporary societies and economies. Makerspaces strengthen communities with job creation and facilitate technical skills development through educational programs such as skill training, hackathons, innovation challenges, events, and workshops.

Moreover, makerspaces promote sustainability practices and can support Europe and other regions to be cleaner and competitive as they contribute to reduce pressure on natural resources and support with achieving the European Union's 2050 climate neutrality target.

In Africa, makerspaces can respond to the pressing need for science, technology, and innovation across critical sectors such as agriculture, energy, environment, health, infrastructure development, mining, security, and water, among others. African governments could collaborate closely with makerspaces to accelerate the transition of Africa towards an innovation-driven economy. Makerspaces align with the agendas of governments and initiatives worldwide that aim to build an integrated world based on shared values and prosperity.

Makerspaces contribute to global policy initiatives like the Sustainable Development Goals (SDGs), Science, Technology, and Innovation Strategy for Africa 2024 (STISA-2024), African Union Agenda 2063 (AU Agenda 2063) and the European Circular Action Plan. Support from governments and other key stakeholders is essential for scaling the maker movement.



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Global networks such as the [Africa Makerspace Network \(AMN\)](#), [Global Innovation Gathering \(GIG\)](#) and the [Fab City Global Initiative \(FCGI\)](#) empower makerspaces with opportunities for knowledge exchange, policy advocacy, and capacity-building. These networks project the role of makerspaces and fab labs to communities and the world at large.

Makerspaces possess the infrastructure, expertise, and community support to collaborate effectively with governments to address local and global challenges. However, makerspaces face several challenges including poorly developed surrounding infrastructure, excessive costs of digital tools and equipment, expensive rents, and a lack of political recognition and visibility.

Policy recommendations

This report proposes the following policy recommendations:

1. Leverage the potential of makerspaces by collaborating on national projects that focus on capacity building for youth and entrepreneurs, while promoting locally made products.
2. Create funding initiatives to provide resources for makerspaces to implement research and innovation projects.
3. Endorse maker programs and courses, which refunded by the government and aimed at local communities.
4. Integrate makerspaces into school curricula, particularly focusing on Science, Technology, Engineering, Arts, and Mathematics (STEAM) education.
5. Recognize makerspaces as critical infrastructure for local manufacturers.

Introduction



There is an urgent need to establish policies that enable makerspaces to thrive and empower communities. For one year, the Fab City Foundation and Africa Makerspace Network were privileged to engage with makers and stakeholders within the African and European maker ecosystems. Our objective was to gain insights into the barriers and enablers that influence their work and to explore strategies for government recognition and support of makerspaces.

This report serves as a vital tool for steering policy engagements between policy makers and the maker ecosystem. It functions as a common policy agenda, developed through an exchange on existing concepts and initiatives, that considers their relevance in both European and African contexts.

The insights presented are drawn from the perspectives of 69 stakeholders (26 from Africa, 43 from Europe), including makers, founders, educators, managers, and community members from diverse makerspaces.

Throughout this research phase, we addressed the fundamental question: **"What policies can effectively support makerspaces?"** In the following sections, we present thematic policy recommendations gathered from numerous focus group discussions, one-on-one interviews, and a community call.

While acknowledging limitations such as time constraints and participant scope, this project advocates for ongoing engagements with makerspace stakeholders. This iterative process aims to continuously review and refine policies, ensuring adaptability, inclusivity, and the incorporation of diverse perspectives into a comprehensive and effective policy framework.



Photo credits: Fab Lab Barcelona



Makerspaces in economies and societies TODAY

Makerspaces have a profound impact on both local communities and the global landscape, driving innovation in social, educational, and business sectors (Lindtner, Hertz & Dourish, 2014). These dynamic spaces influence education, job creation, economic development, open-source initiatives, supply chain resilience, mental health, peace-building, and emergency resilience.

A key framework for understanding how makerspaces can support governments and communities is through the concept of the "3Es":

- **Education** (Learning)
- **Economic development** (Earning and job creation)
- **Emergency response** (Resilience)

One of the core mandates of makerspaces has been to create an environment for learning by doing. Makerspaces provide tools, materials, and technology, and offer a wide range of activities such as coding, robotics, woodworking, or 3D printing, that cater to various interests, needs, and learning styles. It provides a platform for learners to bridge theoretical knowledge into practical skills, shaping a generation of innovators with the skillsets anticipated for future job opportunities.

Makerspaces are fertile ground for businesses to start and flourish. Makerspaces such as [Fab Lab Barcelona](#), [Techshops](#) in the United States, and [Design Technology Institute](#) (DTI) in Ghana have incubated several startups and businesses through their activities. These spaces create job opportunities not only for the learners but also their surrounding communities.

In terms of emergency response and resilience, makerspaces have demonstrated agility during critical situations. For example, during the COVID-19 pandemic, maker communities utilized digital fabrication tools to manufacture essential items such as face shields and protective gear. It is estimated that about 48.3 million items of personal protective equipment (PPE) were made and distributed by local makers (World Economic Forum 2021) around the world.

Makerspaces align closely with critical global initiatives, including the Sustainable Development Goals (SDGs), European Circular Economy Plan, and African Union Agenda 2063, emphasizing principles of local production, circularity, education, and community building.



Photo credits: Photo by Tima Miroshnichenko

At the core of the maker movement are governing principles like local production (Coskun et al, 2022), environmental sustainability (Coskun et al, 2022), education (Sheridan, 2014) and community building (Wolfgang, 2017).

Through the maker movement, “makers can increase citizens' environmental awareness to promote circular making activities (reusing, repairing, refurbishing, recycling etc.) (SDG11). They can reduce the environmental impact associated with the transportation of goods by enabling on-demand and localized production (Doyle, 2019; Peeters et al, 2019) (SDG12).

The maker movement can also reduce inequalities and exclusion in society compared to traditional manufacturing practices (Casillas-Martín et al, 2020) (SDG10) and initiate more democratic and bottom-up changes towards sustainability by providing citizens with the means, skills, and knowledge required for circular making activities (Galuppo et al, 2019) (SDG8). (Coskun et al, 2022).

For collaborative innovation to thrive, open access to knowledge and broad participation are crucial elements. The integration of makerspaces in government agenda and initiatives will enhance the accessibility of makerspaces, which will enable policy makers, key stakeholders, and the public to foster sustainable impact at the city scale.



Makerspaces' contributions towards the achievement of the SDGs



1 At ConstrACT Lab and Habibi Works, beneficiaries are allowed to make items they need. For example, women from the Katsikas “hospitality centre” in Greece were able to make curtains for their containers at the camp to improve privacy. Others make furniture, cooking equipment, and clothing.

2 WeMake, a makerspace in Italy, acts in projects as a hub of expertise and as an agent of change. WeMake has created in collaboration with CREA (Council for Research in Agriculture and Agricultural Economics) a system of 21 sensors for precision agriculture.

3 Westhill Men’s Shed provides a communal workspace for mostly older men who may be feeling isolated following a major life event such as retirement, bereavement, or a stroke. The shed provides social contact and a sense of purpose without foregrounding the mental health issues that men may be unwilling to confront explicitly.

Since 2016, Gliia has been 3D printing life-saving tourniquets at various hubs throughout Gaza.

4

Fab Lab Barcelona creates contemporary learning environments and experiences to support learning, growth, and innovation for interventions to achieve goals and understanding for future challenges. Gearbox; and DTI are makerspaces in Africa that serve as innovation institutes to give learners hands-on training.

5

Fablab Winam, a makerspace in Kenya, created a special program for females called “she builds” to give hands-on learning to females to bridge the gap in technology among the gender groups. BiT Makerspace also located in Bahir Dar Institute of Technology in Ethiopia, trains young girls in Bahir Dar about women’s roles in the creation and technology through a program called “Google Women Tech Makers Bahir Dar.”

6

Cadus makerspace has built a mobile shower truck and toilet to support crises in places like Ukraine and the Balkan route. Community Creativity 4 Development (CC4D) built auto water dispensers to ensure proper sanitation in refugee camps during the COVID-19 period.

7

MakerBay built mobile solar cafes that serve various communities. Similarly, Fablab Winam and CC4D constructed small solar panels for charging phones and other electronic gadgets, particularly in refugee camps.

8

Gearbox in Nairobi, Kenya, provides a supportive ecosystem for hardware innovators and entrepreneurs. It introduced a prototyping facility that provides small and medium enterprises (SMEs), startups and innovators with tools that are typically beyond their reach.

9

Through partnerships, BiT Makerspace developed several innovations that respond to local health and food security challenges. For instance, the makerspace worked on the development of a low-cost oxygen concentrator, PPEs and an oximeter during the COVID-19 pandemic. BiT Makerspace also contributed to the development of agricultural innovations to support smallholder farmers.

10

FabLab Coventry promotes inclusivity by organizing events like the BNO (British National Overseas) during Refugee Week 2023, which supported refugees and asylum seekers. Between 2022 and 2023, they supported individuals from 51 different nationalities.

11

Gearbox, TMDC, and DTI equip citizens and communities with skills and spaces that empower them to solve problems increasing resiliency and sustainability of neighborhoods and cities.

12

Makerspaces play a role in reducing the environmental impact by promoting localized production and adopting sustainable practices. For instance, TMDC uses wood dust for making furniture and shelves.

13

CC4D and Fablab Winam are building affordable solar panels with and for communities in deprived areas to promote clean energy.

14

Royal Roads promote life in water and ocean through education and the use of plastic waste from water bodies for making.

15

Baltimore Makerspace and Makerspace are tech innovation hubs that promote the reduction, reuse, and recycling of materials.

16

MboaLab in Yaoundé, Cameroon, is a makerspace dedicated to promoting peace through social innovation, community-based education, collaboration, and mediation. MboaLab is recognized as a peacebuilder center, that aims to consolidate relationships between Internally Displaced People (from the Anglophone region) and Francophone Cameroonians, through activities related to 'Do it yourself' (DIY) and making.

17

The "Circular Spaces" project aims to enhance at least 15% of maker spaces (5 out of 40) in the Baltic Sea region with circular business principles over 27 months. The project will form a consortium of Baltic Sea region makerspaces to collaborate on eco-design and material reuse and to develop a digital tool to boost cooperation in the circular economy. It plans to train and involve at least 300 makers/start-ups in producing more circular products and pilot at least 5 circular business ideas.



Photo credits: Square Films

Recommendations for governments and policy makers

1. Leverage the potential of makerspaces by collaborating on national projects that focus on capacity building for youth and entrepreneurs, while promoting locally made products

The role of young people and entrepreneurs in economic development is crucial. A well-educated and resourceful youth becomes a skilled workforce that boosts productivity, creates jobs, and drives innovation. Nations benefit immensely from economic improvement, which enhances citizens' livelihoods, increases employment opportunities, improves infrastructure, and attracts foreign investments. We recommend that governments collaborate with makerspaces and digital innovation hubs, which already serve as communal spaces for young people to learn and work together.

These collaborations should focus on initiatives that equip young people and entrepreneurs with innovative approaches to solving 21st-century challenges, such as climate change and biodiversity loss. For instance, a budding entrepreneur with a brilliant idea for a new gadget can use a 3D printer at a makerspace to bring their idea to life without having to invest in expensive manufacturing equipment.

Typical example is the collaboration between the Government of South Australia and Makerspace Adelaide organizing hands-on workshops where participants learned circularity focusing on material use/origin, ease of disassembly, reparability and recyclability (see for more, [Circular Economy at Makerspace Adelaide](#)).

Another instance is [FabLab Bohol](#) together with Keio University, a state University in Philippines built a model temporary structure that can be used during disaster situations.



Photo credits: Fab Lab Barcelona

2. Create funding initiatives to provide resources for makerspaces to implement research and innovation projects



Photo credits: Jakub Zerdzicki

Cities have lost the capacity to create products and grow food. However, makerspaces and fab labs globally promote local production at the community and neighbourhood levels by combining traditional methods with digital fabrication and modern technologies. Makerspaces embody the principle of thinking globally while acting locally. With the resources available in makerspaces and fab labs, most products can be designed, customized, and made using locally sourced materials, including waste, thereby reducing reliance on global supply chains.

We encourage governments to enhance their efforts in reinventing their economies and transitioning to self-sufficiency.

Governments should allocate a portion of their sustainable development projects to support makerspaces. By enacting policies that promote the patronage of locally made products, governments can foster the development of commercially viable activities within makerspaces and fab labs. Additionally, governments can provide rent-free spaces, repurpose underutilized public buildings, or facilitate partnerships with private landlords to reduce the financial burdens on makerspaces and fab labs. These efforts can significantly alleviate financial constraints, freeing up resources for innovation and development.

In Maryland US, there is a collaboration between non-profit organizations and local governments to obtain grants to support makerspaces in the state (see for more, [Maryland County Funding](#)).

3. Endorse maker programs and courses, which are funded by the government and aimed at local communities

Several cases in regions like Asia exemplify how top-down government interventions can help scale up the maker movement into successful businesses. These examples indicate that more commercially oriented makerspaces often develop from the ground up and receive government support to sustain and further develop. For instance, the SEG makerspace in Shenzhen was rebranded as a 'makerspace' and transformed into an 'incubator and accelerator' in response to the government's call. This transformation was completed within 20 days of the government's announcement supporting makerspaces and attracted numerous visits from local politicians and investors.

To support the scalability of makerspaces, governments should endorse makerspaces and their initiatives, as well as educational programs that further legitimize the maker movement and attract support from other stakeholders, including local communities. Bottom-up approaches, combined with top-down interventions, can be instrumental in developing a more accessible and inclusive maker culture in various contexts.

Government funding is crucial to the sustainability of makerspaces. Additionally, governments should support makerspaces by mentioning them in speeches at gatherings, advocating for the development of more makerspaces to align with national science and technology agendas, giving makers a seat at the table in high-level meetings, and participating in maker events, interviews, and workshops.

In 2013, the Department of Trade and Industry addressed gaps and bottlenecks in the value chain of priority industries by helping to set up fab labs in the Philippines. (see more, [Department of Trade and Industry](#)).

In Recife, Brazil, with the backing of government funding and support, a once-isolated island has been transformed into a hub of technological innovation. This area now accommodates over 330 technology companies, providing employment for 11,000 individuals, and boasts approximately 800 entrepreneurs as of 2020 ([Porto Digital](#)).



Photo credits: IOme254

4. Integrate makerspaces into school curricula, particularly focusing on Science, Technology, Engineering, Arts, and Mathematics (STEAM) education



Photo credits: Global Innovation Gathering

The world is amidst a significant digital transformation known as Industry 4.0 that is reshaping our lives, work, and interactions. Currently, there is a gap between education and employment, which necessitates support for students to develop not just knowledge and skills but also ethical values for sustainable communities. Governments should collaborate with makerspaces and fab labs to integrate these innovative spaces into schools, offering students opportunities to cultivate Industry 4.0 skills and proficiency in modern technologies.

Governments can enhance educational infrastructure by ensuring that at least one school per community is equipped with a makerspace.

Additionally, implementing train-the-trainer programs for teachers will facilitate effective integration of makerspace pedagogy into curricula.

To effectively implement this recommendation, governments should collaborate with makerspaces and schools to develop guidelines for integrating makerspaces into the existing school curricula. Flexible requirements to operate makerspaces in schools and universities will also promote collaboration, internships and project-based learning that enhances critical thinking, problem-solving, and creativity.

Establishing links between makerspaces and education/universities can further support the commercialisation of research and foster innovation and industrialisation.

The Rwanda Makerspace Consortium in partnership with the department of education, organized training for teachers as the first step to provide makerspaces to 20 schools in Rwanda. This initiative aims to offer hundreds of students the opportunity to engage in Playful Engineering-Based Learning ([Rwanda Consortium Goal](#)).

5. Recognise makerspaces as critical infrastructure and local manufacturers

Recognizing makerspaces as critical infrastructure and local manufacturers entails more than just providing equipment. Makerspaces should be envisioned as community hubs and integral components of national infrastructure development. By acknowledging their impact, we can bridge the gap between local innovation and real-world impact.

Friessnig and Ramseur (2022) argue that recognizing makerspaces as active participants in infrastructure development acknowledges their potential to address real-world challenges, foster entrepreneurship, generate knowledge, mobilize citizens, and transform manufacturing practices in cities.

In recent years, makerspaces have played a crucial role in addressing global challenges. For example, makers worldwide produced an estimated 48.3 million items of personal protective equipment valued at \$271 million.

A crucial first step for governments is to formally designate makerspaces as critical infrastructure by implementing the policy recommendations outlined in this report. This designation would ensure equitable access to supplies and streamline regulatory support and approvals. Governments should also publicly acknowledge the role of makerspaces and fab labs in local manufacturing. For instance, makerspaces could receive awards or establish connections with industry and universities for their contributions during the COVID-19 pandemic. Governments can further empower makerspaces and fab labs by involving them in sustainable and innovative projects within local communities.

In Ethiopia, BiT makerspace distributed essential personal protective equipment (PPE) to local hospitals and testing centers. Additionally, they have been collaborating with the University of Cambridge on developing a low-cost oxygen concentrator. We could also mention the work of Twenti Makerspace in Malawi, which distributed over 6,000 visors to public hospitals, schools, and local businesses within a few weeks of launching their operations.



Photo credits: Fab Lab Barcelona

Join the Fab City Movement

From a makerspace to a maker city, the next step from supporting a makerspace, further into the future

Currently, 52 governments of cities, regions, and islands across five continents have embraced the Fab City movement, led by mayors and government representatives.

A Fab City takes the 'Fabrication Laboratory' or fab lab concept to a wider scale with 'Fabrication Cities.' In these cities, makerspaces and fab labs play pivotal roles in local manufacturing and consumption. Fab Cities share a vision for a new socioeconomic model rooted in robust local manufacturing infrastructure, supported by globally distributed data.

The Fab City movement empowers cities to evolve into self-sufficient and locally productive ecosystems. This transformation occurs through collaboration among citizens, city officials, policy makers, community groups, makerspaces, fab labs, schools and universities, and other institutions.

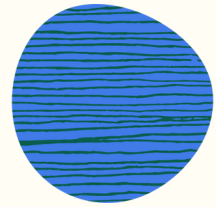
Current Fab Cities

Amsterdam, Velsen, Auvergne-Rhône-Alpes, Montpellier, Toulouse, Paris, Rennes, Valence Romans Agglo, Brest, Occitanie, Bali, Sumedang, Parepare, Papua, Pemkab Bangka Tengah, Barcelona, Bas-Saint-Laurent, Montreal, Curitiba, Sorocaba, Belo Horizonte, São Paulo, Recife, Bhutan, Detroit, Boston, Sacramento, Oakland, Cambridge, Somerville, Plymouth, Ekurhuleni, Georgia, Mexico City, Yucatán, Puebla, Guanajuato, Hamburg, Augsburg, Kamakura, Kerala, Linz, Südburgenland, Ljubljana, Santiago de Chile, Seoul, Shenzhen, Veberöd, Zagreb, Zadar, Córdoba, Oulu



Photo credits: Fab Lab Barcelona

Conclusion



In conclusion, we aim to support governments and policy makers to empower communities and improve the livelihoods of citizens. This report presents recommendations that highlight makerspaces as local hubs crucial for national and regional advancement. Makerspaces have demonstrated their transformative impact on education, productivity, entrepreneurship, job creation, and sustainability practices.

The key recommendations for governments and policy makers are:

1. Leverage the potential of makerspaces by collaborating on national projects that focus on capacity building for youth and entrepreneurs, while promoting locally made products.
2. Create funding initiatives to provide resources for makerspaces to implement research and innovation projects.
3. Endorse maker programs and courses, which are funded by the government and aimed at local communities.
4. Integrate makerspaces into school curricula, particularly focusing on Science, Technology, Engineering, Arts, and Mathematics (STEAM) education.
5. Recognize makerspaces as critical infrastructure and local manufacturers.

Makerspaces are integral parts of broader ecosystems such as the [Fab City Global Initiative](#), capable of catalyzing global connections for governments and international and community organizations.

This report acknowledges the diverse contexts in which these policies will operate and emphasizes the importance of involving stakeholders from local to global scales for effective implementation. These policy recommendations aim to empower makerspaces to enable local communities to shift from reliance on product exportation towards local manufacturing, repair, and product reuse.

As these policies are implemented, communities will evolve uniquely and will leverage available resources and expertise to create innovative solutions.

Governments are encouraged to use these recommendations to inspire opportunities for makerspaces, and to align with science and technology agendas across Africa and Europe.



About the African European Maker Innovation Ecosystem (mAKE) Project

The African European Maker Innovation Ecosystem (mAKE) project is aimed at strengthening existing networks of makerspaces as key drivers for local digital innovation in Africa and establishing mutual and sustainable networks with European digital innovation hubs (DIHs).

mAKE enables makerspaces to amplify their voices and advocate for better innovation policies. It will facilitate dialogues with policy makers at various levels. Leveraging experience and partnerships, mAKE will engage with intermediary organizations, local governments, and relevant non-governmental organizations (NGOs) to enhance policy frameworks for digital innovation and distributed manufacturing.

The policy recommendations highlighted in this report are because of insights collected from over 50 African and European stakeholders in 2023. Development of the common policy agenda is led by the Fab City Foundation and the Africa Makerspace Network.

Special thanks to:

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Vulca Seminar 2023 mAKE Session Participants

Attendees who shared their insights in a workshop and discussion led by the mAKE team held on 24th November, 2023.

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