

African Strategy For Fundamental and Applied Physics (ASFAP)

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**8th edition of the African School of Fundamental
Physics and Applications (ASP2024)**



**Co-organized by Cadi Ayyad Mohammed V Universities at Faculty
of Science Semlalia, Marrakesh, Morocco from 7-21 July 2024**

Key insights from this talk

- **Why is capacity building in Physics so crucial for Africa?**
- **How does Physics drive Africa's technology and science development?**
- **Why is it essential for Africa to adopt a grassroots-driven Physics strategy?**
- **How does Africa's scientific community contribute to shaping its scientific policies?**

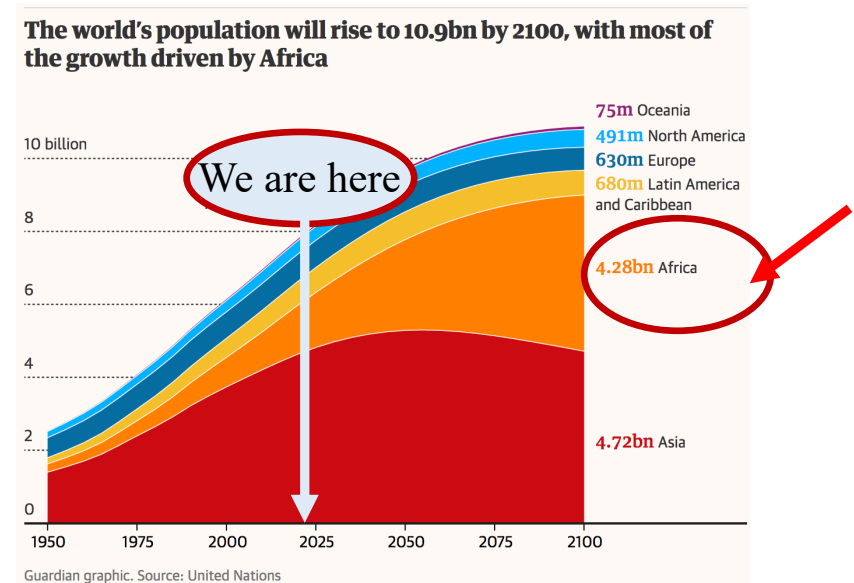
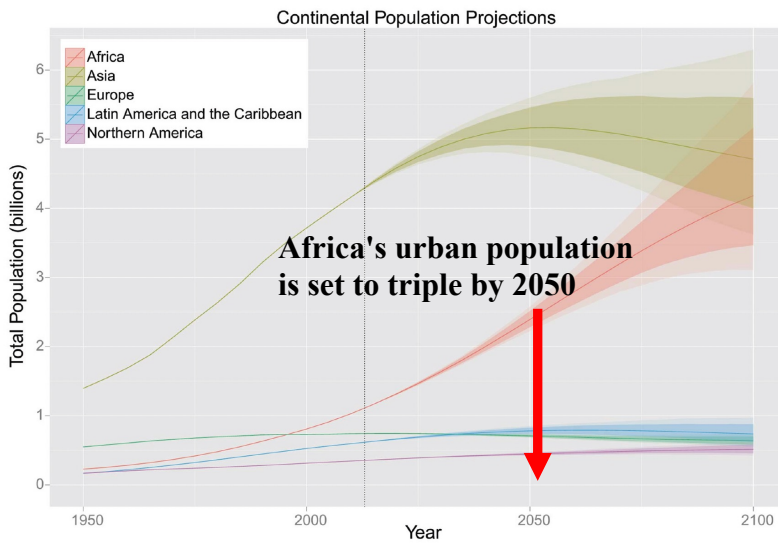
Today: Challenges in Africa

- Numerous challenges hinder science knowledge creation and technological innovation in Africa
- Infrastructure limits hinder R&D efficiency
- Low literacy hinders access to scientific information
- Limited education access prevents innovation
- Limited network access impedes connectivity & information sharing
- Digital illiteracy obstructs modern tools usage
- Gender inequality limits women's educational opportunities
- No Science Advisor means less strategic science guidance
- Brain drain: talent lost to emigration



Africa's Future Challenges

- **By 2050, Africa is projected to host a quarter of the world's population according to the United Nations, with over half of its own population under the age of 25**
 - **This offers great opportunities but also poses big challenges**
 - **Africa's fast-growing population will impact geopolitics, trade, migration, and all aspects of life**

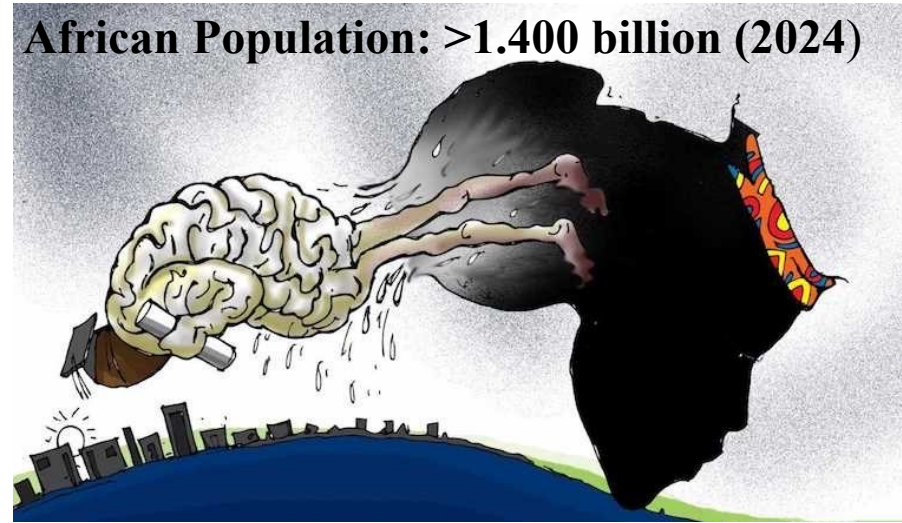


- **What can African leaders and global support do to address these challenges?**
 - **It's time to boldly rethink Africa's future**

Africa's Talent Shortage

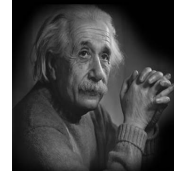
- Most African nations invest less than 1% globally in R&D
- With roughly 198 researchers per million people
 - Showcasing the impact of chronic underfunding on Africa's research landscape
- The talent gap worsens due to persistent brain drain
 - 20,000 skilled professionals leave for developed nations yearly
 - Seeking better opportunities unavailable on the continent
- To align with the global average for researchers per capita,
 - Africa requires an additional one million PhD holders
- Deciding not to act is like taking a step backward
 - How can we reverse this trend?

African Population: >1.400 billion (2024)



Where is Africa headed in the 21st century?

It should be possible to explain the laws of physics to a barmaid.



Albert Einstein
German Theoretical-Physicist
(1879-1955)

QuoteHD.com



- **Underfunding in scientific research hinders Africa's development**
- **Africa must bridge the gap in science and technology**
 - **Scientific knowledge is crucial for solving development issues in Africa**
- **A key actor in this process is the Policymakers**
 - **They should invest in education, research, and innovation to enhance Africa's performance significantly**
- **Why is capacity development in physics crucial for Africa?**
 - **Investing in physics education** builds a skilled STEM workforce for innovation and development
 - **Building physics research capacity** tackles local challenges, drives tech advancements, and contributes to global knowledge
 - **Physics capacity aids job creation** in Africa's growing population, spanning tech, engineering, and research
 - **Physics expertise is crucial** for modern infrastructure development, supporting a growing population and economy

Physics Strategies Worldwide

- **European Strategy for Particle Physics**

- 4rd Iteration. 2006, 2013, 2020, **2027**
- Mandated by the CERN Council
- Actively solicits the opinions globally



- **US Strategy for Particle Physics**

- 2nd iteration. 2013, Snowmass in 2021 process to develop the strategic plan
- Mandated by American Physical Society, Division of Particles and Fields (DPF)



- **Latin America Strategy for High Energy Physics, Cosmology and Astroparticles**

- First time in Latin American
- Mandated by Ibero-American Ministerial Science and Technology

- The EU, US, Australia, and Asian strategies are continuously developed and updated through close collaboration, ensuring coordinated efforts across regions

- **Africa must develop its Physics Strategy to catch up!**

- People in Africa are uniting to create the first grassroots physics strategy

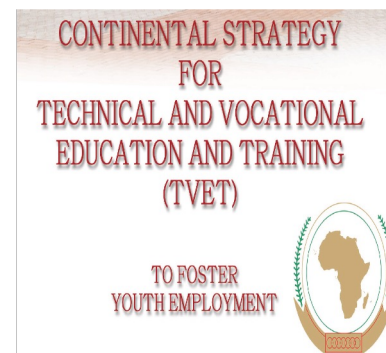


African Union strategic initiatives

- Africa has already seen several strategies emerge from major political bodies and institutions, each with clear roadmaps



- The true challenge lies in effectively executing and implementing the strategies!



- Numerous strategies and challenges with implementation
 - **What changes can we expect from ASFAP?**
 - Engage African scientists and global partners in strategy development
 - Enhance and maintain networking efforts
 - Promote grassroots physicist-led strategies over top-down government initiatives, lacking broad physicist community consultation
 - Involve the physics community to actively shape strategic directions
 - Strengthen the African Physical Society as a professional body
-
- **Our vision is to empower Africa to emerge as an equal co-leader in the global scientific community, resulting in tangible socio-economic benefits!**



- **The ASFAP initiative is co-founded by the Pan African and African Diaspora physicists:**



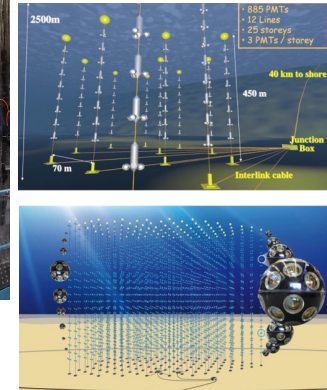
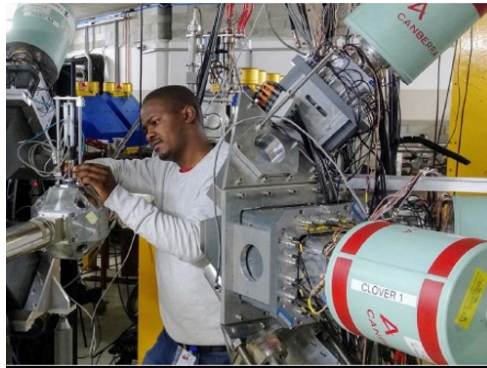
- **Dr. Kétévi Adiklè Assamagan** (BNL, USA)
- **Prof. Simon Connell** (University of Johannesburg, SA)
- **Prof. Farida Fassi** (Mohammed V Univ. in Rabat, Morocco)
- **Prof. Shaaban Khalil** (CFP, Zewail City, Egypt)
- **Dr. Fairouz Malek** (CNRS and Grenoble Univ., France)

Steering Committee:

ASFAPSteeringCommittee@cern.ch

- **ASFAP is mandated by African Physical Society**
- **ASFAP aims to fortify the African Physical Society as a leading professional body**

The Hope is Great for Science in Africa



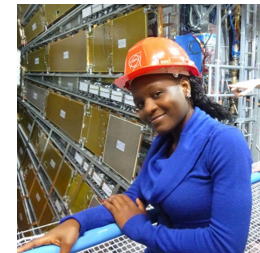
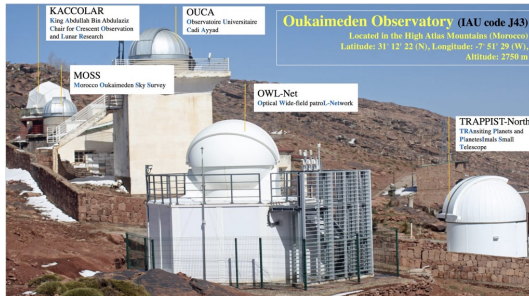
iThemba Labs for Accelerator Based Sciences
it is a multidisciplinary research facility

Moroccan Foundation for Advanced Science

Morocco in ATLAS, ANTARES and KM3NeT

Astronomy; Observatories and Telescopes

- SAO
- SALT
- Boyden
- Hartebeesthoek
- Hermanus
- HESS



South Africa in ATLAS and ALICE

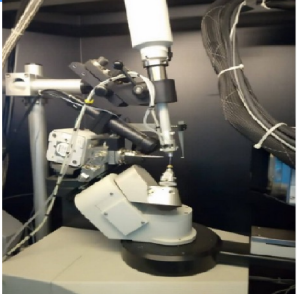


Neutrino Experiment

The Deep Underground Neutrino Experiment (DUNE) is a neutrino experiment under construction, with a near detector at Fermilab

Madagascar in DUNE

More on Scientific Infrastructures in Africa...



The first X-ray techniques platform in Bénin devoted to the community

Square Kilometer Array



The Moroccan Sustainable Energy; "Masen"



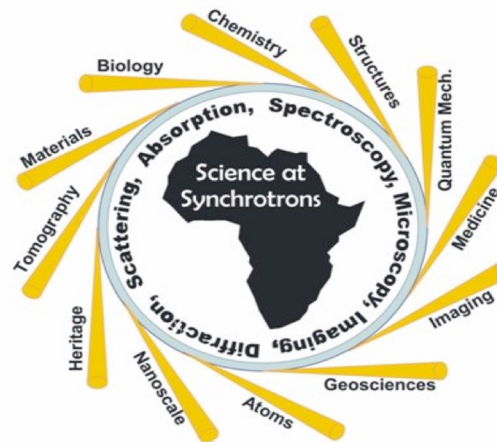
World's biggest solar plant in Morocco Noor



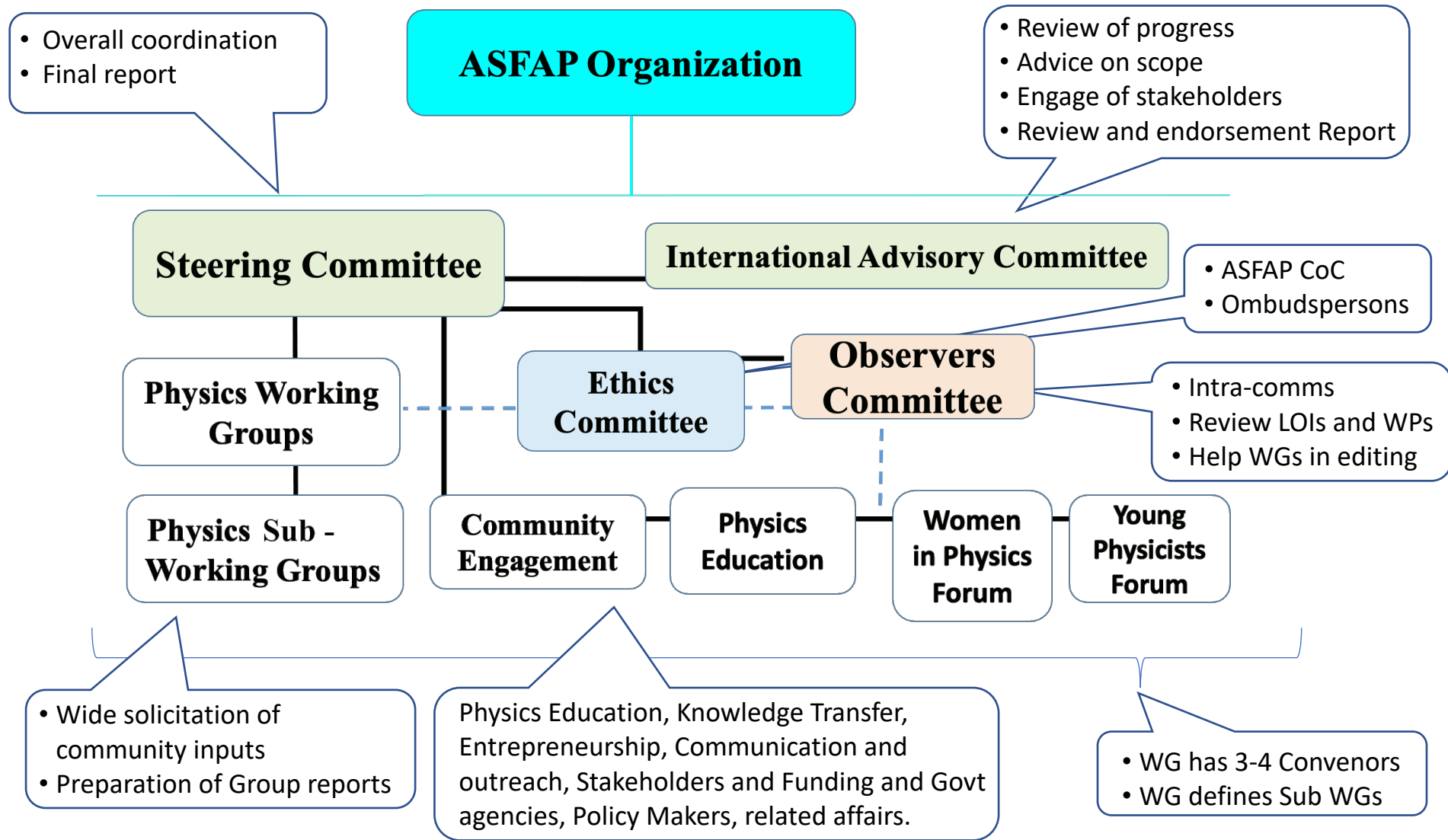
- Africa lacks a light source, a crucial interdisciplinary tool, unlike other regions

The African Light Source:

- Future-Ready Large-Scale Research and Innovation Hub
- An advanced light source emits intense X-rays, ultraviolet, and infrared radiation



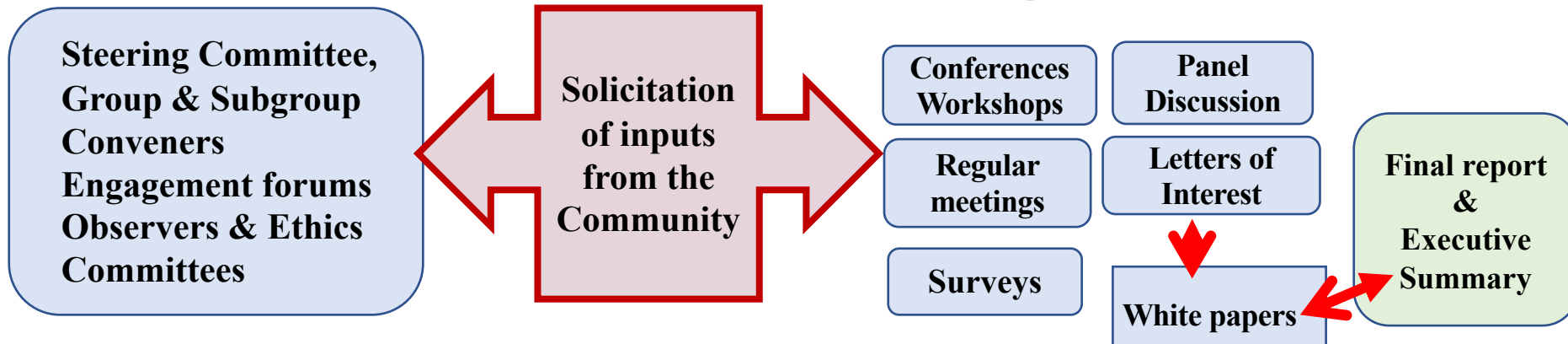
Structure and Organization



ASFAP General Structure

- **Broad representation spanning Diverse Disciplines and Fields**

Submit LOIs : <https://indico.cern.ch/event/1061921/>



- Progress discussion in the relevant groups
- Reports of the Groups/Subgroups and fora at the Conveners levels
- Strategy report at the Steering Committee level
- IAC provides feedback and advice

- The process spans a few years and culminates in the release of the ASFAP executive summary
- **The summary will provide guidance and actionable recommendations for the upcoming decade**
- **The process will be updated periodically, approximately every 7-10 years, over the coming decades. This will include a review of the impact of previous strategies to inform future directions**

ASFAP Physics and Engagement Working Groups

DOCUMENTS

Founding Document
Strategy Report
WG Guidelines

SUPPORTS

Endorsement
Financial & In-kind

ORGANIZATION

Steering Committee
Advisory Committee
Group Conveners



AFRICAN STRATEGY FOR FUNDAMENTAL AND APPLIED PHYSICS (ASFAP)

Scientific and technological achievements have become commonplace. As remarkable as these achievements are for other regions of the world, enormous challenges and opportunities remain to be addressed in Africa. Although vital for development, Africa's science, innovation, education and research infrastructure, particularly in fields such as Fundamental and Applied Physics, has been over the years under-valued and under-resourced. The vision is that Africa should take its equal place as a co-leader in the global scientific process, along with all the social-economic benefits thereto. The necessity of initiating ASFAP has become essential for Africa, hence our ambition and motivation to jump-start this process.

**ASFAP has 16 Physics Working Groups
and 6 Engagement Groups**

ENGAGEMENT

Community Engagement
Observers Committee
Ethics Committee
Physics Education
Women in Physics Forum
Young Physicists Forum

PHYSICS GROUPS

Accelerators
Astrophysics &
Cosmology
Atomic & Molecular
Physics
Biophysics
Computing & 4IR
Earth Science
Energy
Fluid and Plasma
Instrumentation &
Detectors
Light Sources
Condensed Matter &
Materials Physics
Medical Physics
Nuclear Physics
Particle Physics
Optics and Photonics
Complex Systems

Code of conduct & WG Docs



EVENTS

1. ASFAP Town-Hall summary in Cern Courier
2. African Workshop on Computing and Fourth Industrial Revolution, August 11, 2021
3. A collective strategy for physics in Africa, Symmetry Magazine
4. ASFAP Community Town Hall, July 12-15, 2021
5. ASFAP on RFI 24/05/2021. "Quelle stratégie pour une véritable renaissance scientifique en Afrique?"
6. The Steering Committee of the African Strategy launched ASFAP on November 18, 2020, during an online workshop organized jointly by AfPS and AfLS
7. ASFAP was presented at the 107th meeting of the European Committee for Future Accelerators (ECFA) on November 20th, 2020.
8. An introduction of the ASFAP strategy project was presented on December 8th, 2020 at the 12th General assembly of the African Academy of Sciences (AAS).
9. ASFAP is on ECFA Newsletter #6
10. Physics in Africa: invest to reform and transform, Nature 590, 551 (2021)

Web : <https://africanphysicsstrategy.org/>,

Wiki : <https://twiki.cern.ch/twiki/bin/view/AfricanStrategy>

Twitter: <https://twitter.com/StrategyAsfap>

- **Logistics:** Website, Twiki pages for working groups, repository, mailing lists, etc

The International Advisory Committee

Currently, the confirmed members of the advisory committee are:

- **Prof. Ahmadou Wagué** (President of the African Physical Society, [AfPS](#))
- **Prof. Atish Dabholkar** (Director of ICTP)
- **Prof. Azwinnndini Muronga** (Dean of Science, Nelson Mandela University, South Africa)
- **Prof. Emmanuel Tsesmelis** (CERN International Relations)
- **Prof. Faiçal Azaiez** (Director of iThemba LABS, South Africa)
- **Dr. Fadila Boughanemi** (EU Deputy Head of International Cooperation, Research and Innovation Unit)
- **Prof. Omar FASSI-FEHRI** (The perpetual secretary of Hassan II Academy of Science and Technology, Morocco)
- **Prof. Fernando Quevedo** (Former Director of ICTP)
- **Prof. James S. Gates** (Brown University, President Elect of APS)
- **Dr. Latifa Elouadrhiri** (Physicist Jefferson Lab & DOE, USA)
- **Prof. Malik Maaza** (iThemba Labs, South Africa, Representing the African Academy of Sciences (AAS))
- **Prof. Michel Spiro** (President of IUPAP)
- **Prof. Mohamed Hassan** (President of TWAS)
- **Dr. Najat Mokhtar** (IAEA Deputy Director General and head of the Department of Nuclear Sciences and Applications)
- **Prof. M. Norbert Hounkonnou** (President, Network of African Science Academies (NASAC))
- **Prof. Petra Rudolf** (University of Groningen, The Netherlands, President of EPS)
- **Prof. Raheel Qamar** (Head S&T Sector, ICESCO)
- **Dr. Raissa Malu** (member of the Democratic Republic of Congo Presidential Panel to the African Union)
- **Prof. Rob Adam** (Director of SKA, South Africa)
- **Prof. Rohini Godbole** (India Institute of Science)
- **Prof. Rolf Heuer** (President of the SESAME Council)
- **Prof. Setsuko Tajima** (President Elect of the Japan Physical Society, Osaka U., Japan)
- **Prof. Wang Yifang** (Director at IHEP/CAS, China)
- **Prof. Winston Soboyejo** (Former president of AUST, Nigeria, Provost Worcester Polytech. Inst., USA)
- **Dr. Shamila Nair-Bedouelle** (UNESCO Assistant Director-General for Natural Sciences)
- **Dr. Takalani Nemaungani** (Department of Science and Technology, Acting Chief Director of Astronomy, South Africa)
- **Prof. Young-Kee Kim** (Louis Block Distinguished Service Professor of Physics Chair, University of Chicago, USA)
- **Prof. Zeblon Vilakazi** (Vice Chancellor, University of the Witwatersrand, South Africa).



- **The committee comprises international institutes and leaders from Africa and beyond**

National and international organizations Support

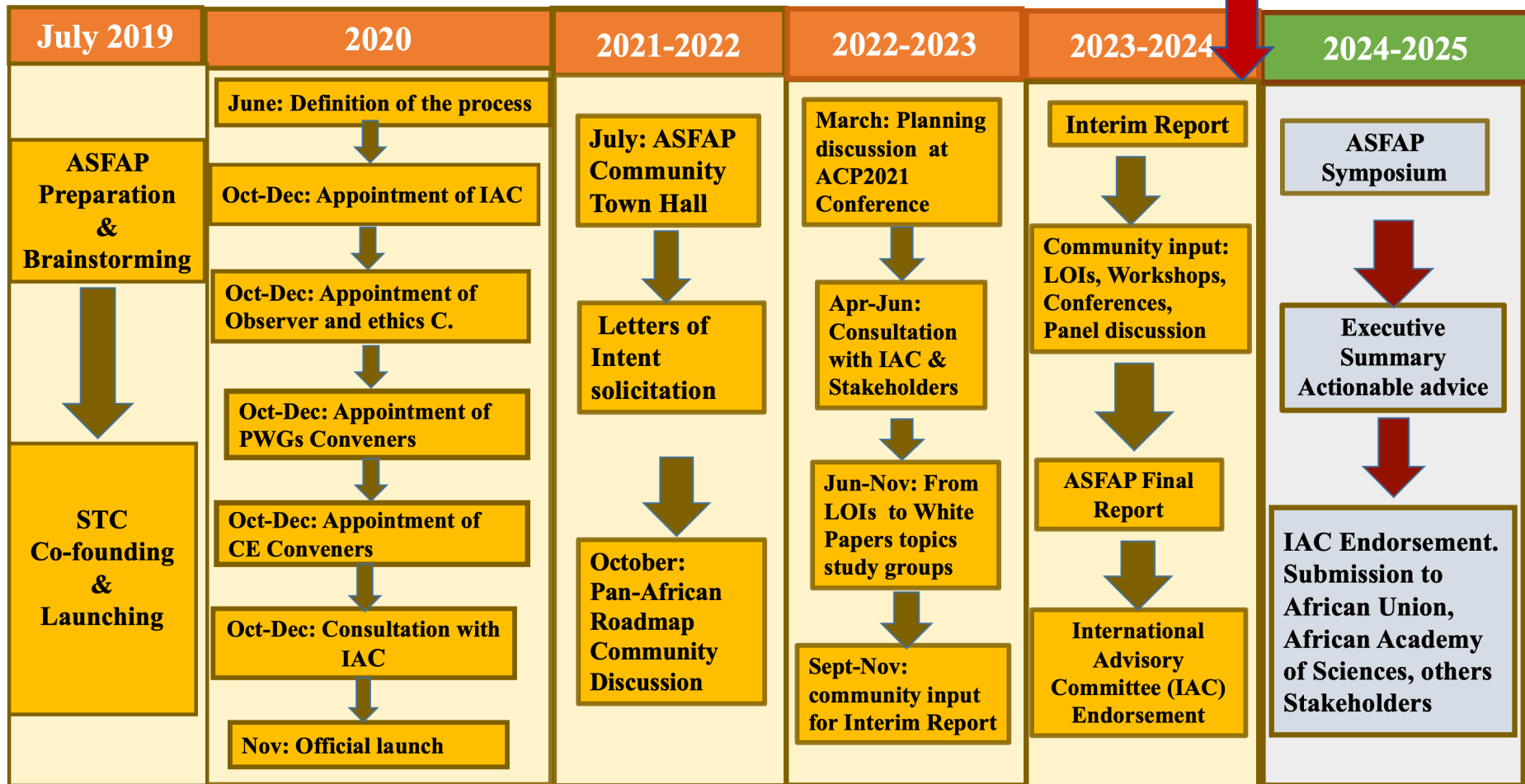
- Funding agencies and governments, alongside various organizations, institutions, and academies



<https://africanphysicsstrategy.org/>

ASFAP roadmap

We are here!



- **Currently crafting the ASFAP report**

- **Editing template provided by STC to Physics WGs and forums for guidance**
- **Reports from PWGs and forums contribute to building the final report**
- **Monthly progress meetings for discussion**

ASFAP Report and symposium

• Report:

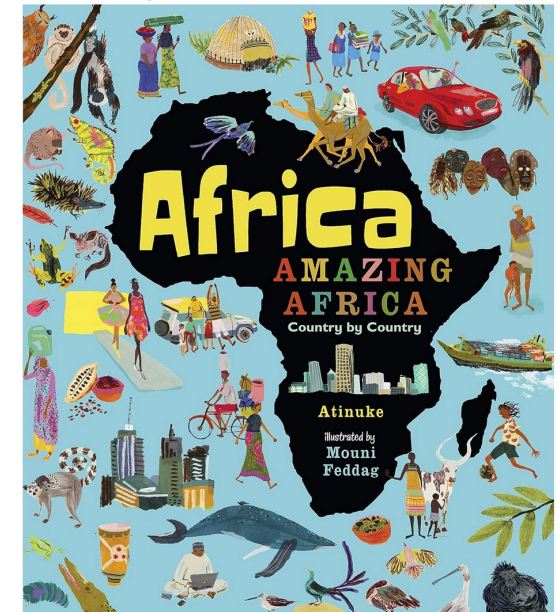
- **UNESCO has a strong interest in the ASFAP report and is dedicated to supporting it through the following initiatives:**
 - **Offering secretarial assistance for editing and formatting**
 - **Providing partial travel coverage for the symposium**
 - **Facilitating the dissemination of the report to other interested parties**
- **We have also submitted an application to IUPAP and are actively exploring additional funding sources**

• Symposium:

- **We propose to integrate the ASFAP symposium with the 4th African Conference of Fundamental and Applied Physics, ACP2025**
 - **Scheduled to be held at the University of Lome, Togo**
 - **From September 29 to October 4, 2025**
- **We propose aligning the ASFAP symposium with ACP2025,**
 - **Scheduled for October 5-9, 2025, Togo**

Conclusions

- **ASFAP was founded with a bold ambition for change, driven by:**
 - **Physicists facilitated extensive grassroots-level community consultations**
 - **Extensive influence in key physics and engagement topics for Africa**
- **ASFAP 's Vision:**
 - **Cultivate a culture of periodic strategic planning among physicists**
 - **Enhance the network of African physicists**
 - **Shape strategic decisions made by policymakers**
 - **Aid funding agencies in efficiently allocating resources by identifying optimal investments**



Thank You

Other words in the cloud include: Vinaka, Maake, Asante, Shukria, Dhanyavadagalu, Dankon, Matondo, Dank Je, Mauruuru, Biyan, Tack, Grazie, Mochchakkeram, Arigato, Gracias, Obrigado, Merci, Danke, Welalin, Di Ou Mési, Hvala, Niringrazziak, Nierringrazziak, Grazas, Bedankt, Dakujem, Dziękuje, Juspaxar, Blagodaram, Ngiyabonga, Dank, Kam Sah Hammida, Ar كاش, Manana, Diolch i Chi, Terima Kasih, Taiku, Chokrane, Paldies, Tingki, Gratias Tibi, Ua Tsaug Rau Koj, Dėkuji, Suksamat, Rahmat, Matur Nuwun, 谢谢, Xвала, Kia Ora, Kop Khun Khap, Paldies, Obrigado, ありがとう, Djiere Dieuf, Eskerrik Askio, Tuke, Najis, Nijis, Tuke, Agat, Raibh Maith, Go, Raibh Maith, Agat, Merci, Salammat, Matur Nuwun, Misaoatra, Ua Tsaug Rau Koj, Dėkuji, Suksamat, Rahmat, Matur Nuwun, 谢谢, Xвала, Kia Ora, Kop Khun Khap, Paldies, Obrigado, ありがとう, Djiere Dieuf, Eskerrik Askio, Tuke, Najis, Nijis, Tuke, Agat, Raibh Maith, Go, Raibh Maith, Agat, Merci, Salammat.