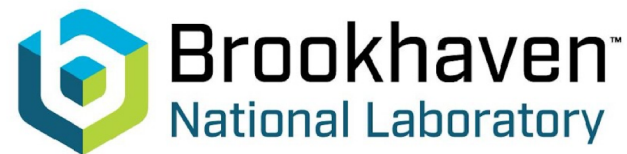


# HEP in Africa



Kétévi A. Assamagan



LHCP 2023



# Why care about HEP in Africa and Latin America?

- The UN General Assembly proclaimed 2022 as the “international year of basic sciences for sustainable development, to improve the quality of life for people all over the world”
  - The UN proclamation resulted from efforts made by the international scientific communities, including CERN, IUPAP and others under the auspices of UNESCO
  - This serves to support constructive engagements with developing countries, to improve their physics education and research programs, for the benefit of all humankind.

<https://iupap.org/2021/12/05/the-international-year-of-basic-sciences-for-sustainable-development-proclaimed-by-the-united-nations-general-assembly-for-2022/>

# Snowmass Recommendations — Engagements with Emerging Countries

Engagement with emerging countries needs improvement for international diversity and pipeline development in HEP, and the global impact and visibility of HEP efforts.

- Universities, laboratories and HEP groups should improve and sustain international outreach, partnerships, schools, workshops, conferences, training, short-visits for research, and development of research consortia.
- Mechanisms should be developed to facilitate the participation of colleagues from developing countries.
- Large international research collaborations should improve efforts to facilitate the integration and participation of research groups from developing countries and support efforts to foster HEP in these countries.

<https://arxiv.org/abs/2301.06581>

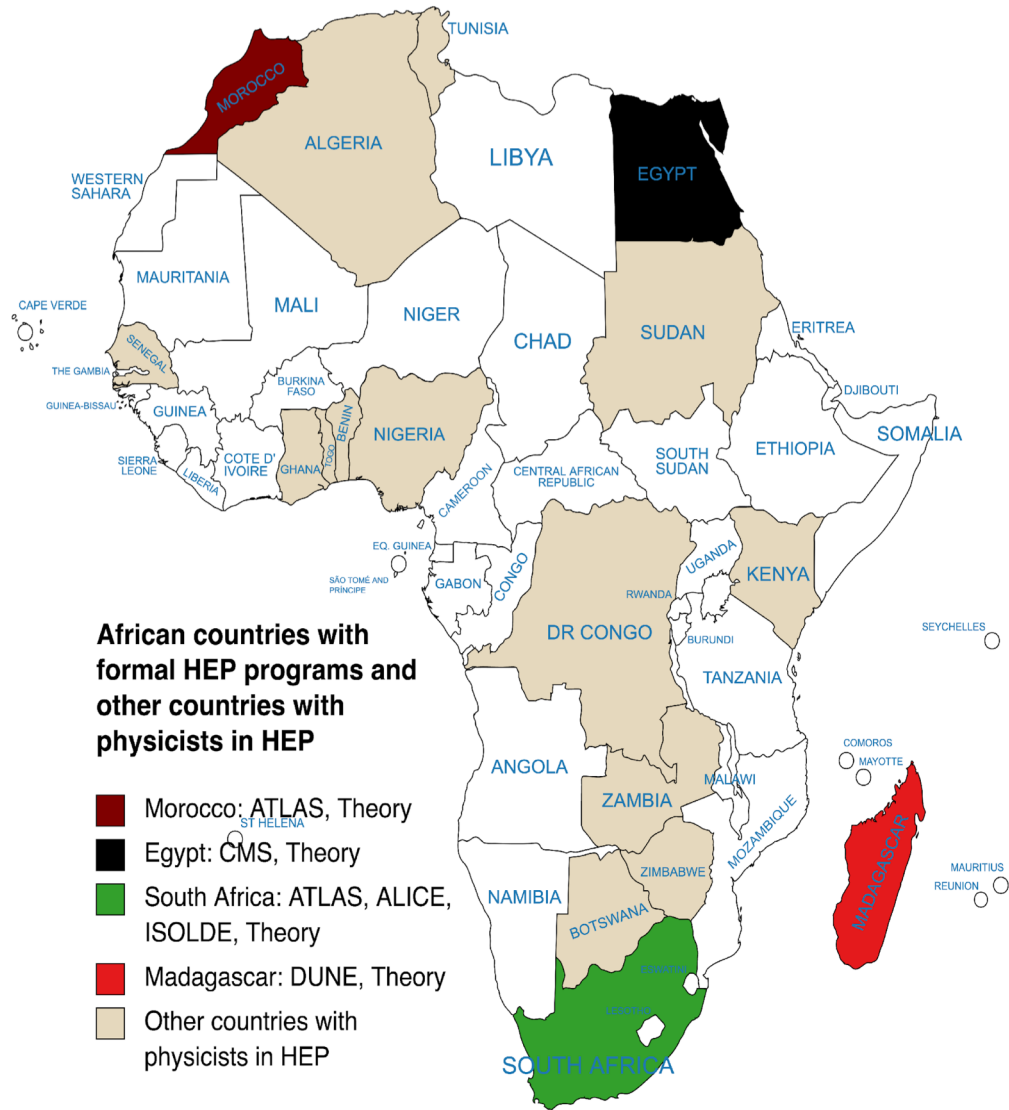
<https://arxiv.org/abs/2211.13210>

<https://arxiv.org/pdf/2209.12377.pdf>

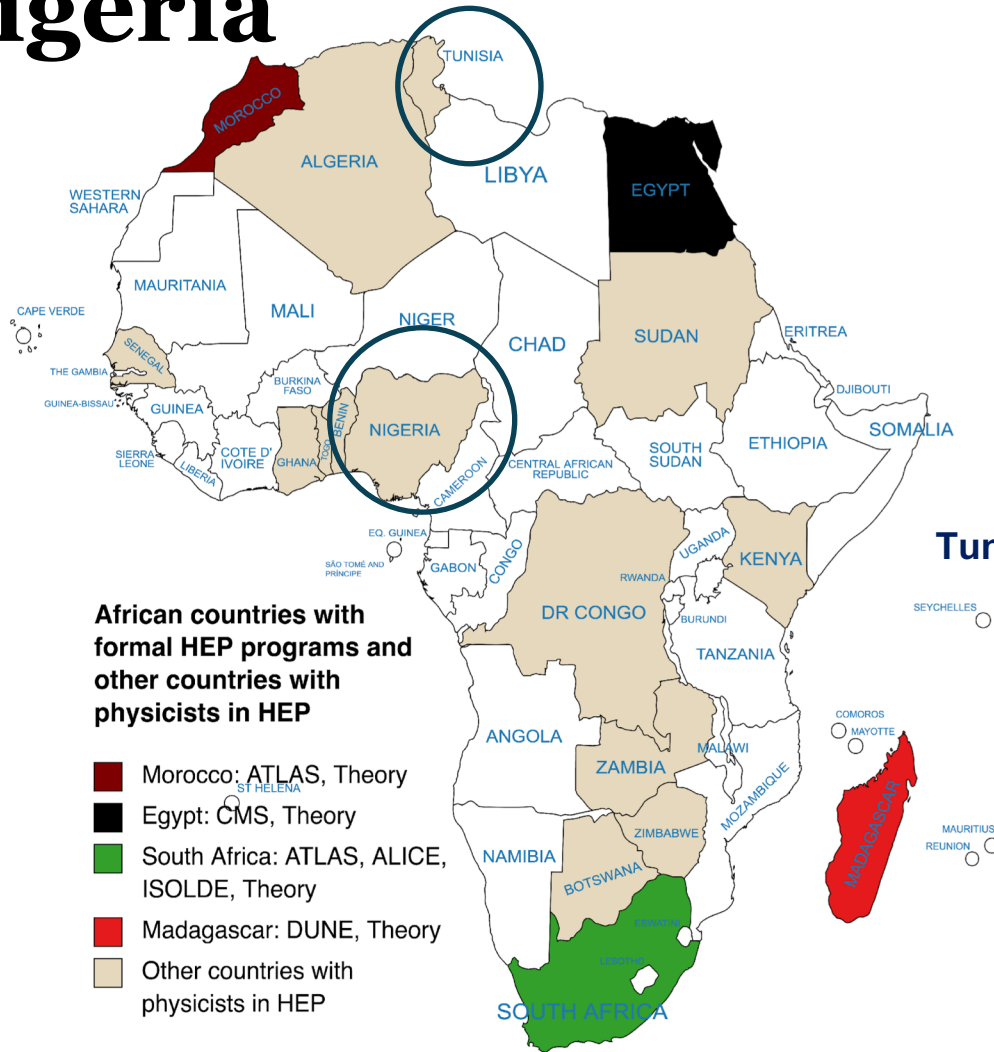
# HEP in Africa – Morocco

## Moroccan HEP Cluster

- ★ Joined ATLAS in 1996
- ★ Hosted ATLAS week in 2013
- ★ Cluster of 7 institutes
- ★ EM Calorimeter
- ★ Software, Computing
- ★ Phase 1, 2 upgrades
- ★ SM, BSM, Higgs,
- ★ Dark Sectors
- ★ ~40 people
- ★ ANTARES/KM3NeT



# HEP in Africa—Egypt, Tunisia and Nigeria



## Egypt

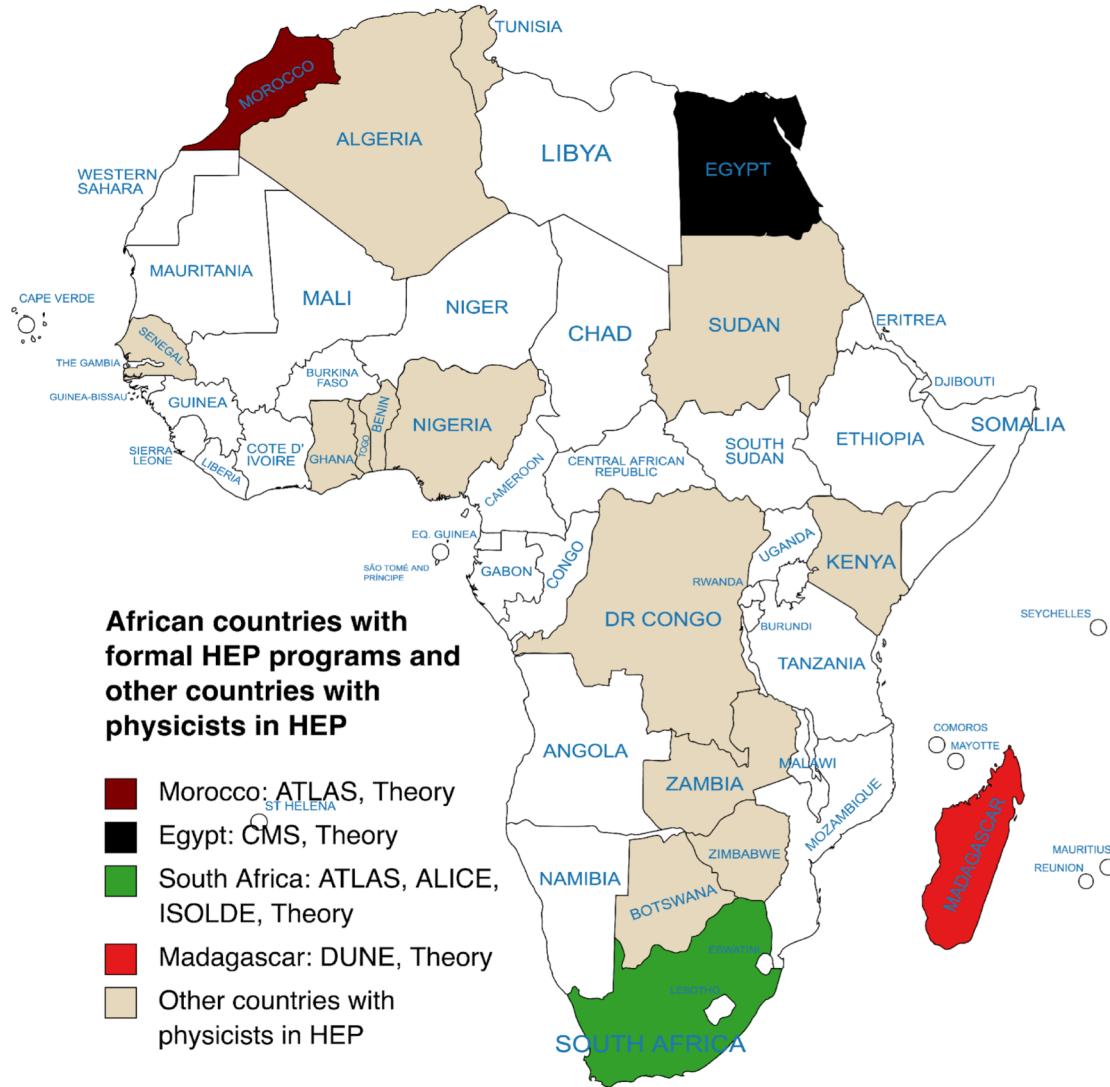
- ★ Egyptian Network of HEP joined CMS in 2010
- ★ 2019, CHEP-FU member of CMS
- ★ RPC tests, assembly, Trigger; GEM
- ★ SM, Higgs, BSM, Dark Sectors
- ★ Super computer lab
- ★ ~31 people

**Tunisia is an associate member of CMS**

**Nigeria's status in CMS?**

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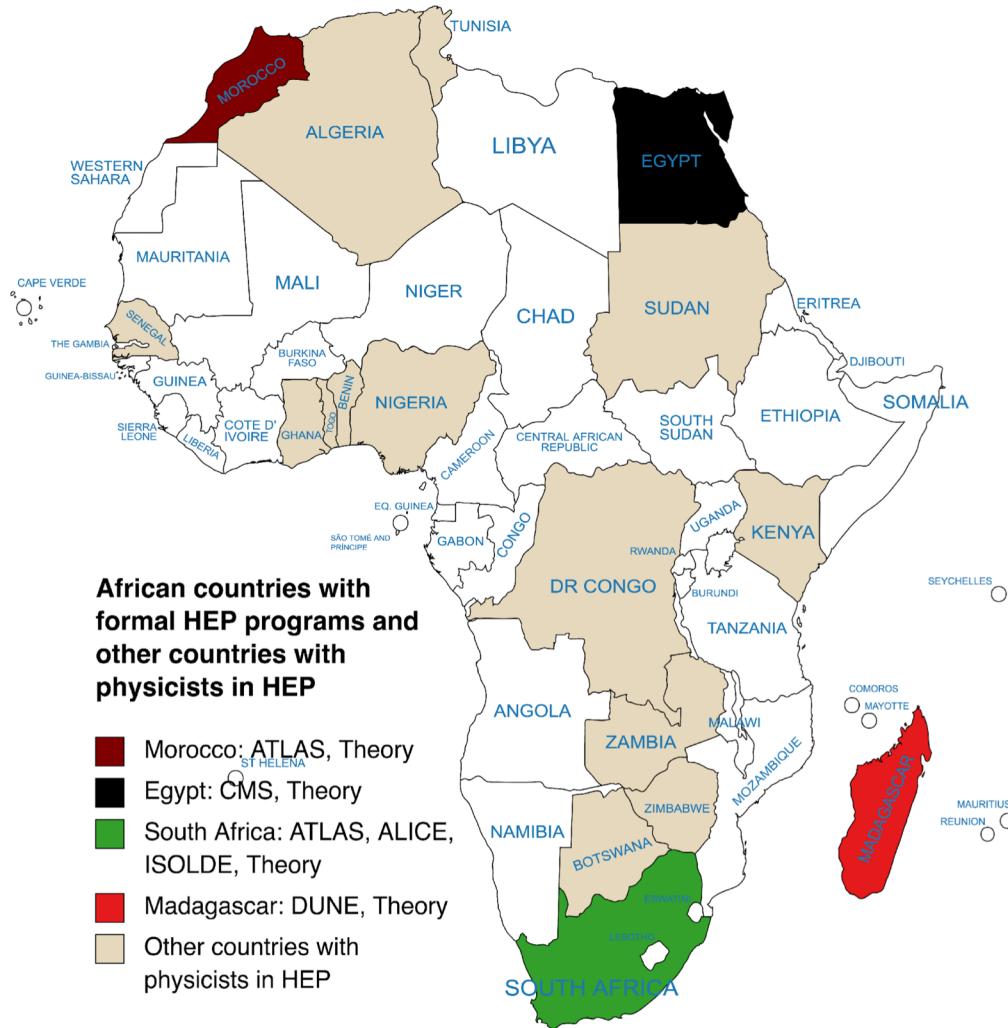
# HEP in Africa—Madagascar



- Madagascar**
- ★ Member of DUNE
  - ★ Near detector CDR
  - ★ 6 people
  - ★ HEP phenomenology
  - ★ HEPMAD conference series since 2001

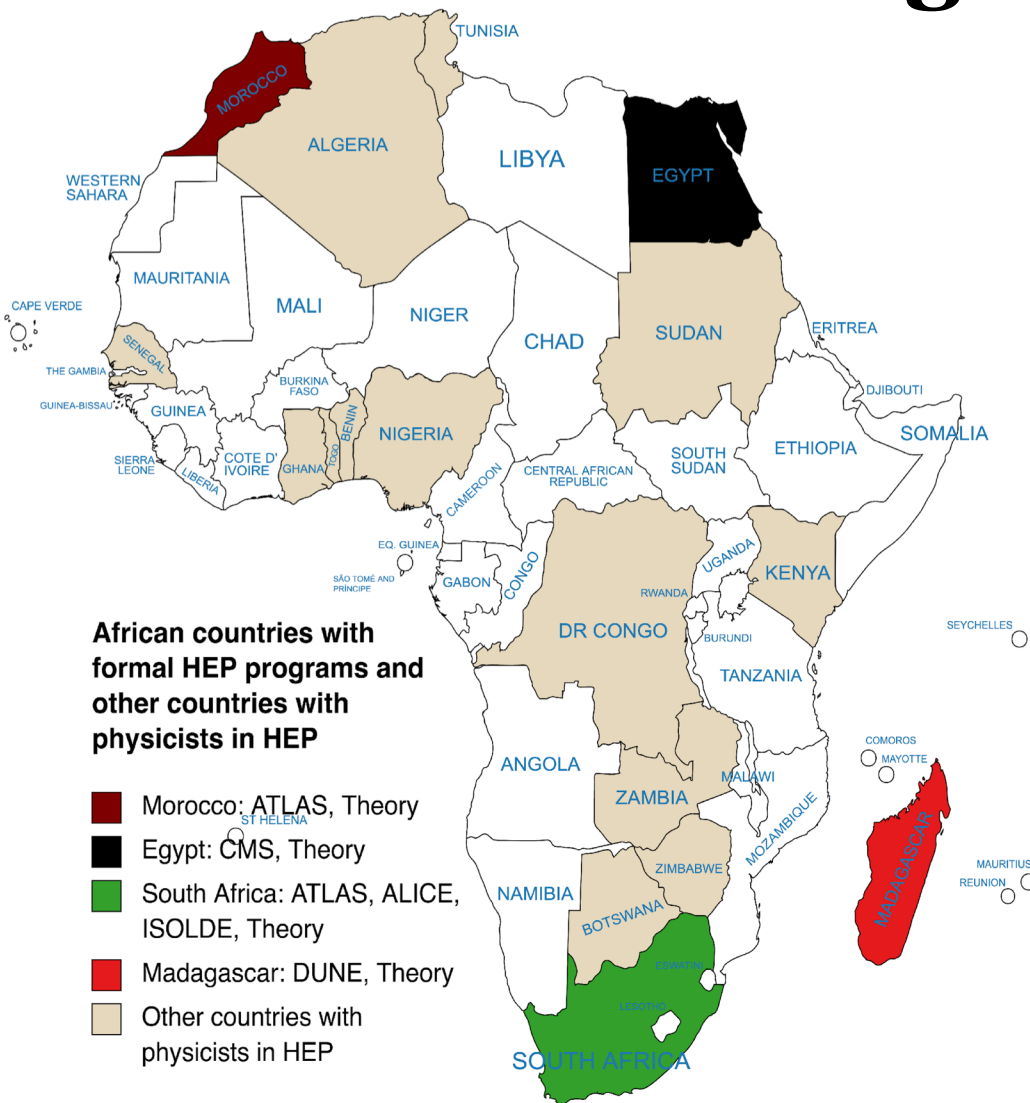
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# HEP in Africa—South Africa



- South Africa – CERN Program**
- ★ ALICE since 2001, 3 institutes: dHLT, di- $\mu$  studies, upgrade
  - ★ ATLAS, affiliation to BNL 2008-2010, full member since 2010. Significant group, rich physics
  - ★ ISOLDE
  - ★ Theory, computing

# HEP in Africa—Algeria



Algeria: associate member of LHCb (UFRJ, Brazil) — however, this did not succeed

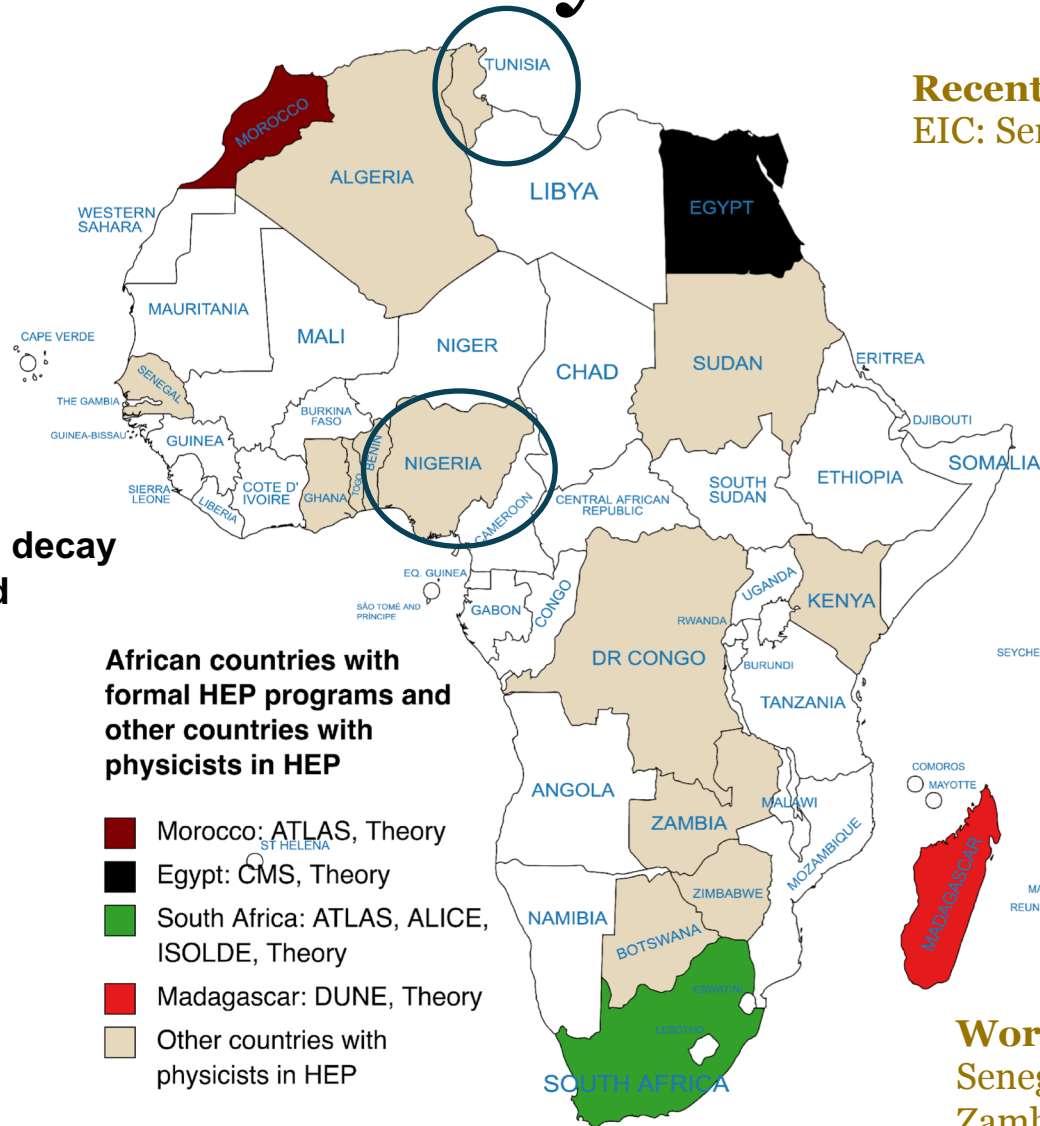
Algeria: Technical Associate Institute in ATLAS:

- Porting ATLAS software to parallel architectures— help ATLAS with computing challenges in LH-LHC
- Monitoring conditions of database access



# HEP in Africa

## Countries with Physicists in HEP



**Recent Development**  
**EIC: Senegal, South Africa**

**nEXO Experiment**  
 neutrinoless double beta decay  
 with 5 tonnes of enriched  
 Xenon-136

**South Africa (UWC)**  
**Nigeria**  
 (thru Drexel University)

**African countries with formal HEP programs and other countries with physicists in HEP**

- Morocco: ATLAS, Theory
- Egypt: CMS, Theory
- South Africa: ATLAS, ALICE, ISOLDE, Theory
- Madagascar: DUNE, Theory
- Other countries with physicists in HEP

**Work In progress**  
 Senegal, Togo → ATLAS  
 Zambia → EIC

# Conclusions

- “[Developed nations] should care about physics in developing countries to support national interests, values and ideals, with the collateral benefit of seeding self-sustaining development.”  
[arXiv:2203.10060](https://arxiv.org/abs/2203.10060)