PITHIA-NRF **Sustainability**

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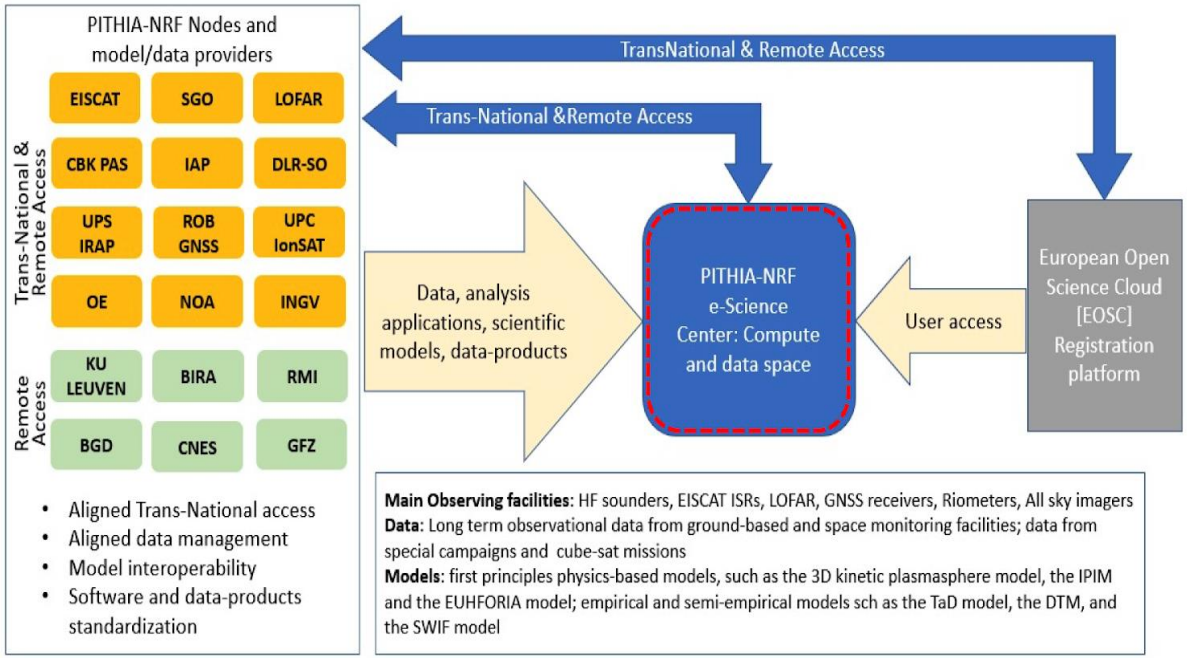
We aim to build a sustainable PITHIA Research Infrastructure

- **Our Strategies**
  - Ensuring PITHIA at the forefront of scientific excellence
    - A community of EU advanced facility nodes
    - Unique collection of quality scientific datasets in the domain area
    - State-of-art service development
    - Well-developed community common standard/policies
  - Unlocking Innovation potentials and stimulating Industry engagement
  - Boosting (Socio-economic or innovation) impact, value and benefits
  - Enhancing PITHIA as the pillar for data production, sharing, FAIRness
  - Ensuring effective governance and sustainable RI life-cycle management
  - Promoting PITHIA in the international arena
  - Sustainable financing models

PITHIA Research Infrastructure (RI) Lifetime

- **Pre-operation Period (3~6+ years)**
  - From first conceptual proposals/planning to the actual operation (incl. planning, design, construction of the facility)
  - Main objectives
    - Identify gaps in the current facility portfolio – the need for the new facility
    - Synergies/interoperability and facilitate exchanges
    - Design/develop integration services/tools based on common community policies/standards
- **Operation Period (6~10+ years)**
  - When services were designed and built
  - Main objectives
    - State-of-the-art infrastructure facilities, cutting-edge technology
    - Number and quality of services offered (availability, usability)
    - Reliability of operation/access
    - Quality of users' output
    - Constantly monitoring
      - internal monitoring
      - periodic review by external expert review panels
      - comments/suggestions from the user community
    - Innovation methods to optimise the RI operation
    - Legal entity with effective governance
- **Termination**

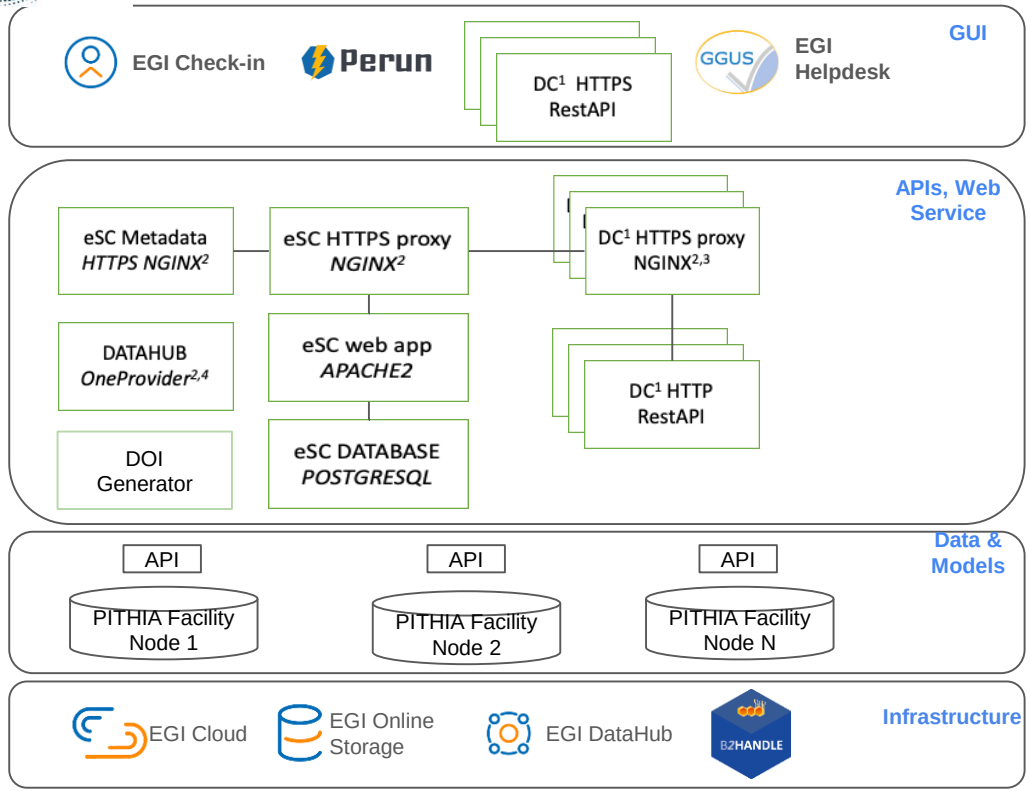
Sustain PITHIA-NRF KERs after project ends



Key Exploritable Results (KERs)

KER1	e-Science Center
KER2	Space Ontology & Metadata Model
KER3	Deployed Dataset/models
KER4	Knowledge Database/Innovation platform
KER5	TNA use cases/Pilots
KER6	Training resource
KER7	Website, Logo, social media

Sustain PITHIA-NRF Operation




User Support


Communication & outreach


Technology Provider


Service Manager/Leader


Data Provider


Infrastructure Provider


Resource Provider

Roles & responsibilities

Service Manager/Leader: (NOA)
- Plan and coordinate service strategy
- Oversee the entire service operation.
- **Compliance**
  - Ensure adherence to data regulations.
  - Maintain standards compliance.
- **Finance and Budgeting**
  - Manage service budget and expenses.
  - Optimize cost-efficiency of operations.
  - Allocate resources effectively.
- **Legal and Compliance**
  - Ensure legal compliance.
  - Address intellectual property rights.
  - Advise on research ethics.

User Support Specialists: (PITHIA scientists)
- Provide technical assistance to users.
- Troubleshoot issues and inquiries -> helpdesk.
- Offer training and user guidance.

Communication and Outreach: (PITHIA community)
- Engage with the scientific community.
- Disseminate service information.
- Gather feedback for improvements.

Data Providers: (PITHIA Facility nodes)
- Handle data storage and backup.
- Ensure data integrity and access controls.
- Comply with data protection regulations.

KER2 KER5 KER6 KER7 KER3

KER1

Technology Provider: (UoW)
- Maintain e-Science center software code.
- Ensure software is up-to-date and secure
- Handle user inquiry

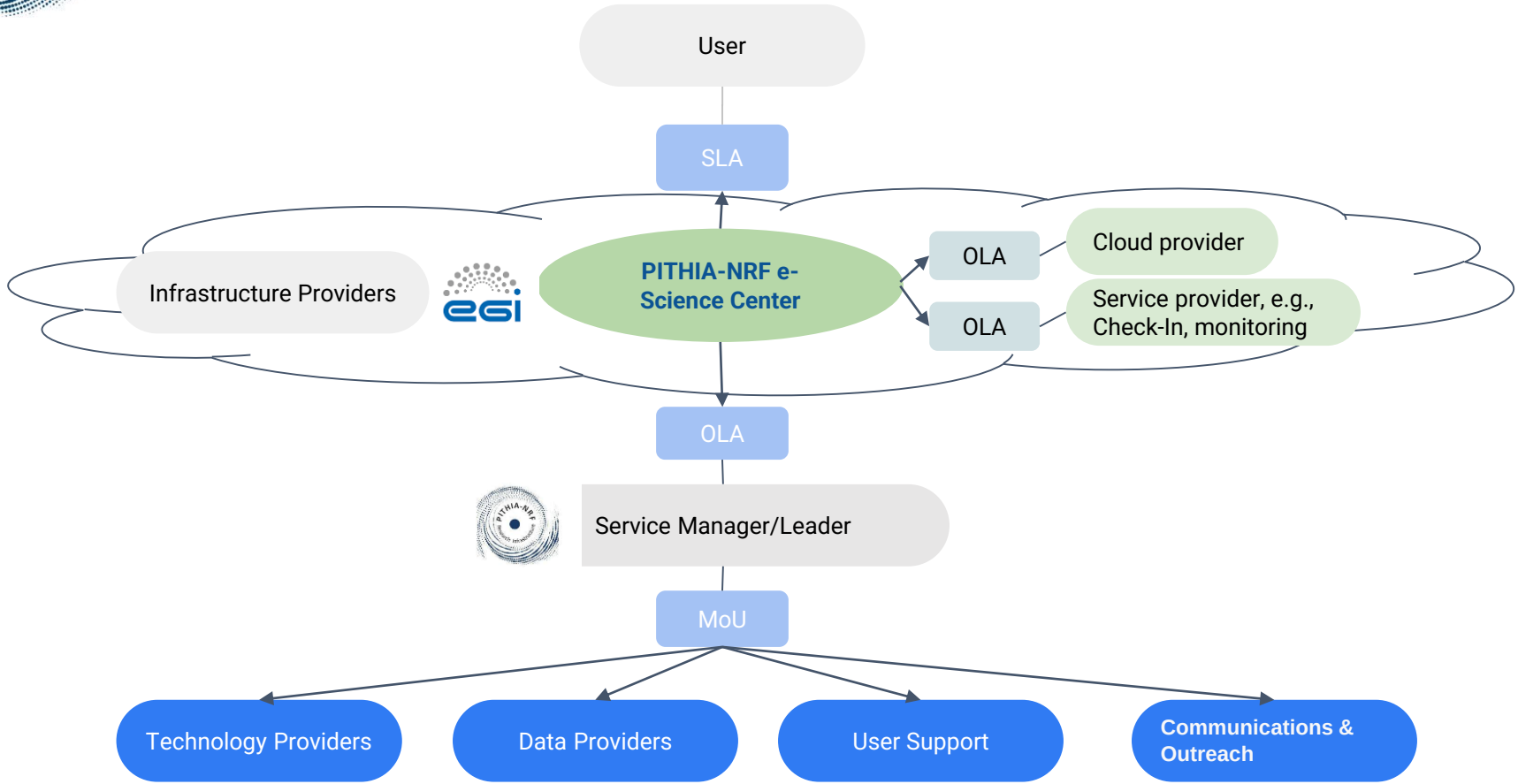
KER1

Infrastructure Provider: (EGI)
- **Operation & administration**
  - Manage user registration (with PITHIA Data Providers)
  - Handle infrastructure related instances
  - Recovery
- **Performance Analysts**
  - Monitor system performance.
  - Analyze resource utilization.
  - Report performance.
- **Vendor/Provider Liaisons**
  - Manage relationships with external providers.
  - Ensure service level agreements are met.
  - Address vendor-related issues.

Resource Provider (EGI third party)
- Configure Cloud & storage
- Handle instance

KER1

Sustain PITHIA-NRF Service Provision



Financial Sustainability

KERs	Missing efforts (per year)	Cost Estimate (per year)
Service Management	0.5PM	4K
User Support	0.5PM	4K
Communication & outreach	0.2PM	1.6K
Data provision	20 x 1 PM (20 Facility nodes)	160K
Technology provision	1 PMs	8K
Infrastructure provision	3 PMs	24K
Resource provision	0.1 PM	0.8K + 10K for Cloud resource
TOTAL	**25.3 PMs per YEAR**	**~ 202,400 per YEAR**

Sustain the PITHIA brand

- A brand is key to stand out and effectively reach and gain loyal customers
- Keep PITHIA to have a persistent community identity, associated with past and present partners/ projects/resources; a cohesive presence in the market that attracts loyal customers
- Sustain the PITHIA Branding
  - Objectives;
    - Ensure a distinctive look/feel across a broad set of communication tools
    - Establish an identity, incl. creating a positive image that can be easily recalled
  - Objects: Logo, Website, Social network & media, Knowledge book,
  - Missing budgets: 0.5 PM + resources -> ~ 5000 Euro per year
  - Sustaining method: Integrate into the e-Science center

Financial Sustainability (pre-operation period)

- Host by an existing infrastructure
- EC projects
  - A proposal submit to call HORIZON-INFRA-2024-DEV-01-01
  - Challenge: EU funding programmes only cover a fraction of the RI overall activities, *incl.* the integration, opening of nation RI, the initial development of pan-European RI
- Co-funding, in-kind contributions

Financial Sustainability (operation period)

- EC projects
- Membership-dues system
  - Member cater for costs of their national node
  - Support for coordination, governance, organisation of joint operations, headquarters
  - Challenges – not entirely satisfactory
    - Instability of members' engagement,
    - Leaving at any time
    - Difficult to move money across national borders
    - Asynchrony between the member commitment and national funding cycles
  - MoU help to stabilise the situation
- National government
- Pay-for-use for high TRL services/datasets
  - Members need to determine an agreed division of operation cost
  - Need to decide on an agreed calculation method
    - Based on full investment, operating cost
    - Can setup charge for the access to added-value services e.g. data RIs
    - User fee covers building (space), common operating consumables, depreciation of equipment, technical support, unit cost of PITHIA capacity
    - Full cost for use of PITHIA must be considered as eligible cost in project funding
- Multiple funding sources from research funding agency, private foundation, public/private sector income attached to the service/data provision deposit fee
- Medium-term funding mechanisms e.g.
  - Netherlands Organisation for Science Research (NWO), NL
  - Wellcome Trust, UK
  - Research Council, NO
  - Swedish Research Council, SE

What are potential legal status for PITHIA? (3~6 year after)

- Staff are part of academic institutions, private sector ⟸ PITHIA is here
  - Difficulty to enter legal arrangement with other organisation
- **ERIC** (European Research Infrastructure Consortium) (22 Member States: AT, DE, ES, FI, FR, IT, NL, NO, SE,UK + 3 associated countries)
  - Facilitate the establishment + operation of RI at the European level, with members countries/intergovernmental organisations
  - Possible VAT exemption
  - No detailed provisions on the basis of which the entity will be set up
- **AISBL** (Association Internationale Sans But Lucratif)
  - Under Belgian Law
  - International association without lucrative purpose
- Others
  - GmbH in Germany, Société Civile in France, Company Limited with Guarantee in the UK
  - Allow national research funding institution be part of multilateral organisation/a node in a global network/use lighter agreement. E.g MoU

What are potential Governance Structure for PITHIA?

- Common governing instances
  - **General Assembly/Assembly of Members/Council**: highest authority with decisions of financial matters and long-term strategy
  - **Executive Committee**: report to GA. Composed of Board of Directors (country representatives), Head of Scientific Advisory Board/Steering Committee and Director
  - **Advisory/Steering Boards or Committees (Scientific, Industrial, Administrative/Finance)**: represents various stakeholders/partners, provide advice
  - **Secretariat/Head Office**: daily business, organise conference; under the leadership of a Director/Director General
- Others
  - E.g. a system of directorship with a CEO assisted by directors of thematic or administrative (finance etc.)

Benefits to Join the PITHIA Community

Visibility

- Greater visibility for data products.
- More use, accessibility of data/model/facilities
- Reinforce and highlight community potentialities

Collaboration network

- Collaboration with ionospheric experts
- New opportunities of cooperation, scientific papers, access to competitive calls
- Increasing exchange of data, expertise within/outside of PITHIA community
- Interactive research applications to foster cooperation with research institutes
- Cross-disciplinary access
- An increased user base
- Broader selection of use cases
- Training, events
- Preservation of intellectual property for posterity
- Innovative use, e.g., via chaining/fusing measurements and models in different ways.

Improved functionality

- Data and model comparison for specific dates
- Improve search results by ontology
- Browsing of multiple available data sets and models (with keyword supported search) for easy and fast selection of data sets and models and their execution
- Datasets that are offline will be archived into databases and then offered to the community.
- Users will be offered online and on request execution of models that are currently non accessible.
- Free and open access to space weather data, both interactively and programmatically

Manage Risks

- Stay up-to-date with technical developments
- Politico-economic context, maybe additional burden
- Risk assessment & management is critical to the RI planning
- In-kind contribution help to increase the number of partners, but introducing risk e.g. overhead of management, scheduling
- Challenge in synchronising different national/partners' ambitions
- Various unexpected events e.g., drop out of partners, changes in political orientation

Accelerate Innovation & Technology Transfer

- Policy makers, funders increasingly expect to see economic benefit
- Demonstrate actual/potential contribution to wider innovation ecosystem help in arguing case for sustainable funding
- Technological potential of RIs is increasingly recognised by industries
  - Industries can conduct own research as users of RIs
  - High-tech industry/services can be built around RIs, e.g. innovation hubs/campuses/parks close to RIs
  - RIs train very qualified professionals highly employable by industry
- Build relationships, transfer knowledge between industries and RIs is important
- RIs also benefit from commercial products /co-development/a fair share of returns

Increase Public awareness & Impacts

- **Engage civil society**
  - Adapt information to enhance the understanding of the significance of the scientific Results, socioeconomic benefit
  - Improve the understanding of societal challenges
  - Help strengthen the dialogue between research communities & society
- **Relations with the local authorities, prepare them for**
  - The unexpected events that can affect the facility
  - Unavoidable steps for upgrades, transformation, termination
  - Can have regular meeting

Summary

- PITHIA strategies for sustainability
- Sustainability objectives
- Operation framework for sustaining PITHIA Operations
- Sustain the community
  - Sustain PITHIA Brand
  - Finance models
  - Legal status
  - Governance structure
  - Risk
  - Involve industries & SMEs for innovation and technology transfer
  - Increase public awareness and impacts