



PITHIA-NRF Sustainability Plan

Yin Chen, yin.chen@egi.eu
EGI Foundation

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PITHIA-NRF Sustainability Framework

PITHIA-NRF KERs

- What are the project products?
- What are the KERs

Sustainable Operation

- Any related design issues?
- How much the cost/effort?
- How to finance (e.g. the e-science centre core functionality needs one funding stream (probably international); The models and datasets are maintained by the contributing centres (probably from national/institutional funds)?
- Any risks, e.g. change of cloud providers, resource become pay4use; staff

Data Management Policy

- How to implement PITHIA-NRF Data Management policies (D1.3)?
- How to implement PITHIA-NRF quality assessment plan (D1.4)?

User Access Policy

- What should be the PITHIA –NRF user access policy?

Sustainable Financing Mechanism

- What financing model PITHIA-NRF would want to go (in-kind/membership/new projects/P4U)?

Sustainable Legal Status

- Will PITHIA-NRF go for a legal entity?
- In what form (Part from academic institutions/ERIC/AISBL)?
- What is the roadmap/action plan?

Sustainable Governance

- What need to be added/removed/improved in a sustainable PITHIA-NRF RI, e.g. legal PITHI-NRF organisation?

Risk Assessment & Management

Innovation & Technology Transfer

Public Awareness & Outreach



What are PITHIA-NRF Sustainability Objectives?

- **Sustainable Operation -> *project KERs***
 - Continuous training and tools for innovation solutions
 - Sustainable operation of PITHIA-NRF
 - Guarantee the preservation of the collected data
- **Sustainable Research Infrastructure Community → *community***
 - Foster a culture of co-operation between the participants and other relevant stakeholders
 - Ensure consultation and integration with stakeholders within and beyond the consortium
 - Engagement of all relevant projects incl. the major ESFRI systems
 - A common vision for the optimized operation of the involved infrastructure so that can be exhaustively used by the researchers
 - A continuous exploitation procedure that will ensure development align with the requirements of the stakeholders
 - Engagement of the private sector to develop innovative products
 - Adjust services to meet the requirements of specific users for validation and calibration of new instrumentation, for testing new instrumentation and for the design and development of new data products. Systematic exploitation of this capability will support sustainability plan
 - A robust e-Science environment based on a solid data management plan



How to sustain PITHIA-NRF Operation?



What operations need to be sustained?

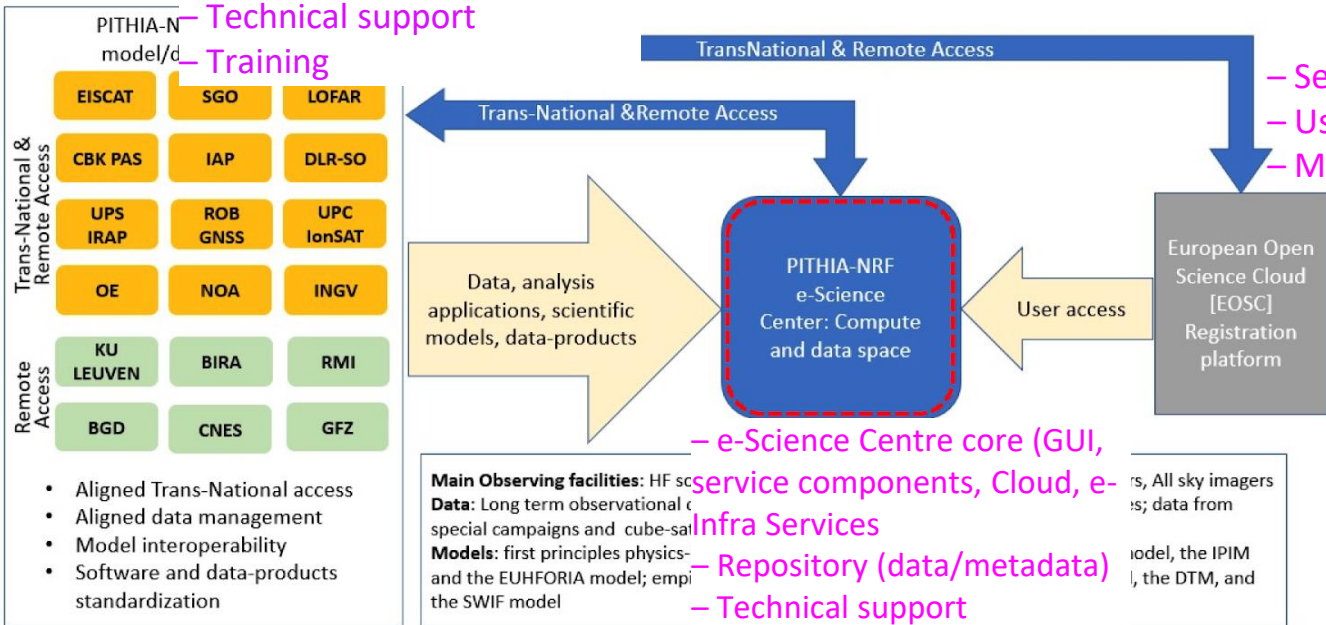
- **Minimal level:** Operation of the existing system with bug fixing
- **Advanced level:** adding new features

--Maintain the data/model (accessibility/availability)

-- User support

-- Technical support

-- Training



- Aligned Trans-National access
- Aligned data management
- Model interoperability
- Software and data-products standardization



How do we develop the PITHIA-NRF sustainability plan?

1

Identify Key Project Results

All outputs generated by the project during its implementation, incl. know-how, innovative solutions, algorithms, prototypes, demos, databases & datasets, trained researchers, new infrastructures, networks etc.

2

Identify Key Exploitable Results (KERs)

The results have the potential to be either commercially exploited, e.g. products or services, or lay the foundation for further research, work for policy making or innovation, e.g. novel knowledge, insights, technologies, methods, data etc.

3

Collect Sustainability Requirements

What need to sustain over time, what strategies is needed to achieve, what resource are required (technology, training, funding, talent)

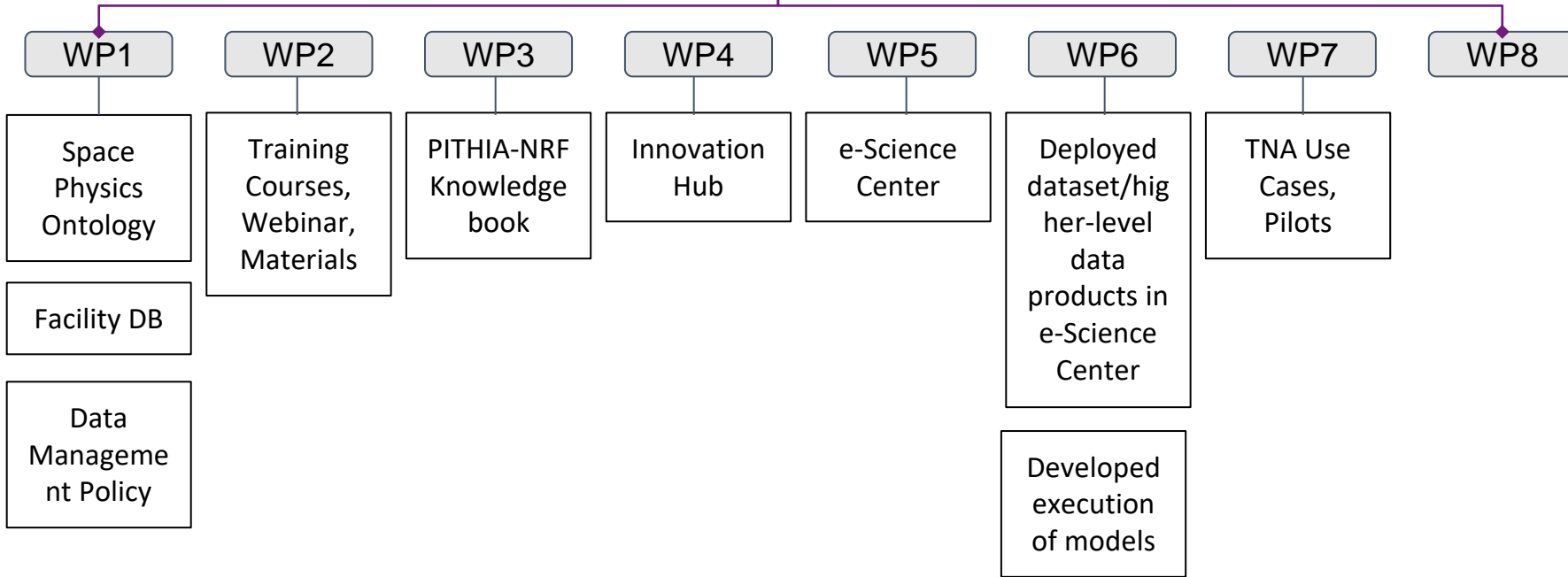
4

Develop Sustainability Strategy and Action plan

Decide on key objectives; strategy incl. funding strategies; the plan how to provide beneficiaries, engagement methods; sustainability tools & activities; target implement time schedule



Identify PITHIA-NRF Main Project Results





Identify PITHIA-NRF Key Exploitation Results

Capacity to sustain

KER1	PITHIA-NRF e-Science Center	<ul style="list-style-type: none">• Maintenance of the source codes, technical support, bug fix• Operations, e.g. keep the service accessible, available• Computing resources, e.g. Cloud, storage
KER2	Space Physics Ontology & Metadata Model	<ul style="list-style-type: none">• Maintenance of the ontology schema• Technical support, training
KER3	Deployed Dataset/models to e-Science center	<ul style="list-style-type: none">• Maintenance of existing dataset/models• Publication/registration of new dataset/models• Technical support
KER4	PITHIA-NRF Knowledge Database	<ul style="list-style-type: none">• Continue availability and accessibility• New campaigns
KER5	PITHIA-NRF TNA Use Cases/Pilots	<ul style="list-style-type: none">• Design doc• Prototypes• Contacts
KER6	PITHIA-NRF Training Resources	<ul style="list-style-type: none">• Continue availability and accessibility• Training events



KER 1 PITHIA-NRF e-Science center

Description	<p>The PITHIA-NRF e-Science center is the central integration tool for data, model and scientific service, providing various tools and process to support the integration and efficient utilisation of PITHIA resources. The main features incl.</p> <ul style="list-style-type: none"> • Management functionalities (register, update, delate) for resources owner • Space Physics ontology • Cloud resource by EGI
Maturity	<ul style="list-style-type: none"> • TRL8 (production)
ProtECIAL Users	<ul style="list-style-type: none"> • PITHIA-NRF facility nodes, space physics data/model providers • Users of PITHIA-NRF dataset & models, data-products, workflows, model developers, service providers/operators/Space Agencies, SMEs, developers of new monitoring instrumentation • Publishers
Capacity to sustain	<ul style="list-style-type: none"> • Code maintenance, technical support, bug fix • Continue operation, and computing resource incl. Cloud (compute + Online storage)
Resource needed	<ul style="list-style-type: none"> • Staff: 2PM per year • Computing resource: during development, €3000 per year (Cloud: 12 vCPU, Storage: 10GB); will need more during operation period (+ X% increasing each year, depending on success)
Related Organisations & financial types	<ul style="list-style-type: none"> • UoW, in-kind • EGI, in-kind + pay-for-use Cloud resource
Action to take	<ul style="list-style-type: none"> • MoU • SLA/OLA for Cloud provision



KER 2 PITHIA-NRF Ontology & Metadata Model

Description	<p>PITHIA-NRF Metadata <i>Ontology</i> defines domain-specific vocabularies for all elements of the Scientific Metadata Model on its predecessor projects ESPAS. ESPAS designs are based on the ISO 19156 standard on Observations and Measurements (O&M), specifically augmented and tailored for the requirements of space physics. PITHIA-NRF ontology extend ESPAS ontology with the novel types of data and new protocol designs for integrating its ESPAS-specific implementation with the e-Science Centre infrastructure and software libraries.</p>
Maturity	<ul style="list-style-type: none">• TRL9 (Operation)
Potential users	<ul style="list-style-type: none">• PITHIA-NRF facility nodes• Space physics data service providers
Capacity to sustain	<ul style="list-style-type: none">• Maintenance of ontology schema• Technical support• Training
Resource needed	<ul style="list-style-type: none">• Staff: 1PM per year• Website: minimal resources
Related organisation	<ul style="list-style-type: none">• BGD
Action to take	<ul style="list-style-type: none">• MoU



KER 3 Developed dataset/model to e-Science center

Description	<p>The PITHIA-NRF e-Science center is the central integration tool for data, model and scientific service, providing various tools and process to support the integration and efficient utilisation of PITHIA resources. The main features incl.</p> <ul style="list-style-type: none">• Management functionalities (register, update, delate) for resources owner• Space Physics ontology• Cloud resource by EGI
Maturity	<ul style="list-style-type: none">• TRL8 (production)
Protecial Users	<ul style="list-style-type: none">• Users of PITHIA-NRF dataset & models, data-products, workflows, model developers, service providers/operators/Space Agencies, SMEs, developers of new monitoring instrumentation• Publishers
Capacity to sustain	<ul style="list-style-type: none">• Availability of the data and model provisions• Technical support
Resource needed	<ul style="list-style-type: none">• Staff: ?PM/year
Related Organisations & financial types	<ul style="list-style-type: none">• All PITHIA-NRF facility nodes, dataset/model providers
Action to take	<ul style="list-style-type: none">• MoU



Cost and sustainability summary

KERs	Missing Budget	Cost Estimate
PITHIA-NRF e-Science Center	2 PMs 10,000 EUR for e-Infra	26K
Space Physics Ontology & Metadata Model	0.5PM	4K
Deployed Dataset/models to e-Science center	20 x1 PM (20 Facility nodes)	160K
PITHIA-NRF Knowledge DB	0.5PM	4K
PITHIA-NRF TNA Use Cases/ Pilots	2 PMs	16K
Training Resources	0.5PM	4K
TOTAL	25.5PMs 10,000 EUR for e-Infra	~ 214 K per YEAR



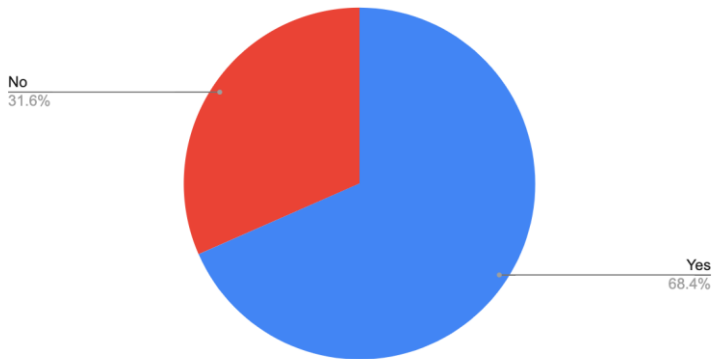
How to finance?

- Financial Sustainability
 - Host by an existing infrastructure
 - National governments
 - A combination of governments/private sources,
 - Share cash/in-kind contributions among partners (with agreement)
 - Self-sustained in later years (provision of services, user fees, Charities/Foundation, crowdfunding etc.)
 - pan-Eu relevance /ESFRI roadmap – EU Framework Programme
 - Bottom-up negotiation with host institutions, open calls from funding bodies
- Challenges
 - Need a robust business plan for continuing funding
 - Agreement
 - How distribute the fund among partners
 - Has to address all partners' benefit
 - Data-management will account for a major proportion of operation cost, incl. e-Infra, technical, HR,
 - Open data – need significant additional resource for long-term data stewardship



PITHIA-NRF Partner's Interests for financing PITHIA Operations (survey results)

7.5 Is your organization willing to contribute actively to the maintenance of the future PITHIA-NRF infrastructure after th...



- 68.4% willing to contribute to the maintenance of PITHIA-NRF future operations
- 31.6% No

New Functions

- RESTful API for e-Science Center
- Link dataset to other e-Science systems

Possible Contributions

- Software Update
- Bug Fixing
- Hosting
- Time
- Expertise
- User Support
- Maintenance of facilities/data/models
- Operations
- Money (indirect via internal staff)

Cost Estimation

- **Per partner:** 30K-130K EUR per year
- **In total:** 350K per year



Action to take

- Monitor project key results
- Keep updating KERs list
- More accurate cost estimation
- Integrate KERs' material/resources into e-Science center
- Onboarding e-Science center to EOSC Marketplace
- Ensure of service provision e.g. Agreements, MoU



How to sustain PITHIA-NRF Community?



What are our strategy?

- Ensuring PITHIA-NRF at the forefront of **scientific excellence**
- Configuring PITHIA-NRF as **skills development** and mobility actors
- **Unlocking Innovation potentials** and **stimulating Industry engagement**
- Boosting (Socio-economic or innovation) **impact, value** and **benefits**
- Enhancing PITHIA-NRF as the pillar for **data production and sharing**
- Ensuring effective **governance** and sustainable **life-cycle management**
- Promoting PITHIA-NRF in the **international arena**
- Financing strategy



Who are the target stakeholders?

- Existing consortium
- External stakeholders ((Internal Contact DB of Stakeholders)
(WP3)
 - 115 academic/research
 - 69 public/governmental
 - 41 private
 - TNA users



What are potential benefit for PITHIA-NRF community stakeholders?

Partner's Interests to Join the PITHIA Community (*survey results*)

Visibility

- Greater visibility for data products.
- More use, more 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 and 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 , event analysis
- 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




How to sustain the PITHIA brand? (*1~2 years after*)

- A brand is key in order to stand out and effectively reach and gain loyal customers
- Keep PITHIA to have persistent community identity, associated with past and present partners, projects, resources; cohesive presence in the market which attracts loyal customers
- Sustain the PITHIA Branding (WP3)
 - Objectives;
 - Ensure a distinctive look/feel across a broad set of communication tools
 - Establish an identity, incl. create 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



What are potential legal status for PITHIA-NRF? (3~4 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

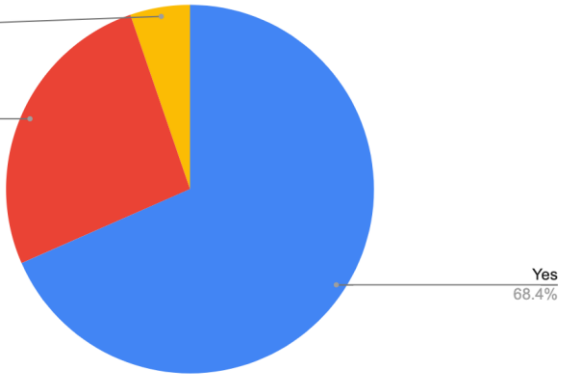


PITHIA-NRF Partner's Interests to Join a Legal Entity (*survey results*)

7.9 Do you see your institution as an official (i.e. legal) part/partner of a future (legal) organization of the PITHIA-NR...

Possibly yes (subject t...
5.3%

No
26.3%



Yes
68.4%

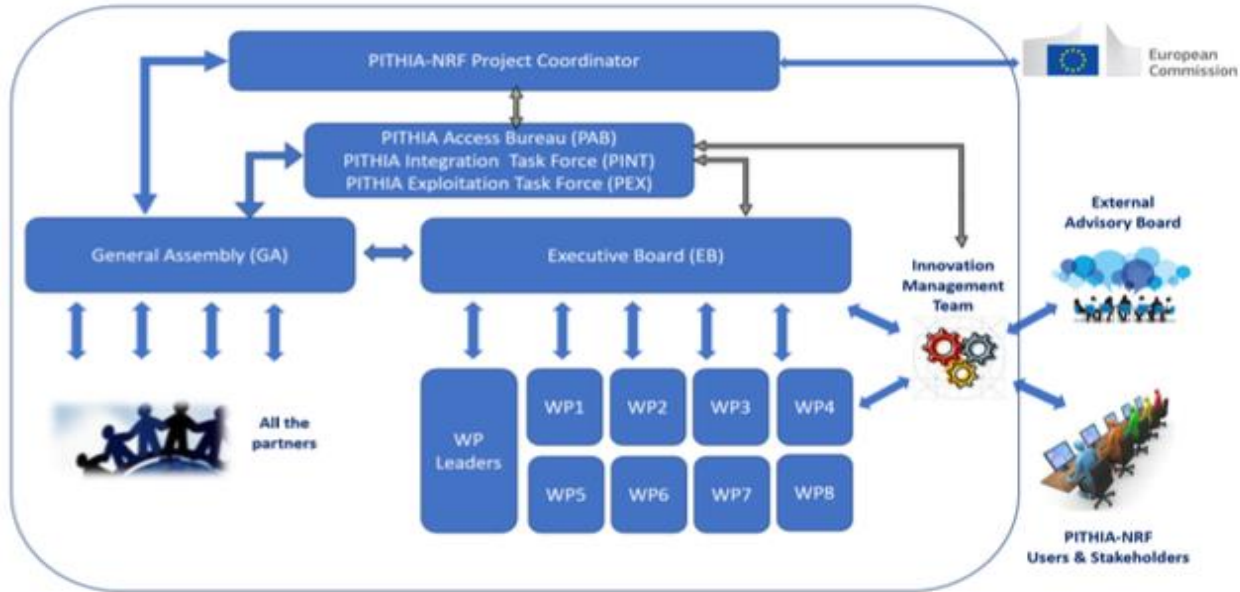
Roles in a legal entity

- Permanent infrastructure that hosts a collection of heterogeneous components
- Data Provider
- Continuing near-real-time weather service, updates to software,
- Technology support
- Facilities provider
- User support
- e-Science Centre platform
- Marketing support
- Operating data resources
- Supporting the e-Science Centre

- 68% are ready to join a legal organisation related to PITHIA-NRF future operations
- 5.3% Possible
- 26.3% No



What are potential Governance Structure for PITHIA Community?



- **Coordinator:** leadership, perform tasks assigned by GA and CA (consortium Agreement)
- **General Assembly (GA):** consortium decision-making body
- **Executive Board (EB):** supervisory body for execution, report to GA
- **PITHIA Access Bureau (PAB):** coordination body for transnational access
- **PITHIA Integration Task Force (PINT):** coordination of science teams, facilities operators, e-science development
- **PITHIA Exploitation Task Force (PEX):** collection of user feedback, follow up implementation
- **Innovation Management Team:** close-to-market activities
- **External Expert Advisory Board (EEAB):** ensure inligh with Eu, global development



How to finance?

- Funding can come from different sources, e.g.,
 - EC projects
 - National government
 - User fees for high TRL
 - Private sector, foundations, foreign partner
 - Co-funding in-kind
 - Membership-dues system
 - Member cater for costs of their national node
 - Support for coordination, governance, organisation of joint operations, headquarters
 - Issues – 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
 - Multiple funding sources from research funding agency, private foundation, public/private sector income attached to the service/data provision deposit fee
 - Long-term funding commitment is difficult at the national level
 - Medium-term funding mechanisms e.g.
 - Netherlands Organisation for Science Research (NWO), NL
 - Wellcome Trust, UK
 - Research Council, NO
 - Swedish Research Council, SE



Can we go Pay-for-Use?

- PITHIA-NRF Members need to determine an agreed division of operation cost
 - E.g. Based on member countries Gross National Income-Share
 - E.g. Members' investments in the RI R&D or actual usage
 - Need to agree before operation starts
- 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



Thank you for your attention!

WEB: <https://www.pithia-nrf.eu>



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