

15 November 2021

digital Briefing

National Strategy Earth System Modelling



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Digital Briefing 15.11.2021 10 a.m. – 12 p.m.

- 10:00 – 10:10 **Plenary Welcome and Introduction**
Jochem Marotzke
- 10:10 – 10:20 **Plenary State of affairs: Project application**
Hendryk Bockelmann
- 10:20 – 11:00 **Plenary State of affairs: Governance and application configurations**
Roland Potthast und Michael Schulz
+Discussion
- 11:10 – 11:55 **Plenary Decision-making process for selecting sprints**
Hendryk Bockelmann
+Discussion
- 11:55 – 12:00 **Plenary Open Questions, Wrap-up and Closure**
Jochem Marotzke
- 12:00 – 12:15 **Internal Meeting Steering Committee**



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Input 1: State of affairs: Project Application



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Nationale Modellierungsstrategie - ESM-Unterstützungsteam

State of Affairs

Towards a National ESM Strategy - Proposal for a National ESM Support Team

- Project duration: 01. November 2021 - 28. February 2025
- Partnership between DKRZ and JSC
- Funding: ~1.8 M€
- Main Focus: Earth system modeling (ESM) relies on complex high-performance computing (HPC) systems, and codes must be continuously adapted to take advantage of upcoming HPC in the exascale era. As part of the national ESM strategy, a support team will assist scientists in this effort.



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Towards a National ESM Strategy - Proposal for a National ESM Support Team



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2 work packages

- process coordination - starting November 2021 at DKRZ
- RSE (research software engineering) support team - starting March 2022 at DKRZ and JSC
- **Process coordination** (overall management of the ESM strategy process)
 - Position still open, need to be filled asap
- **Process assistance** (project communication, workshop organisation, etc.)
 - We are pleased to welcome Maria Rompe to the team

Towards a National ESM Strategy - Proposal for a National ESM Support Team

- **Research Software Engineers** (highly skilled and experienced computational scientists in the field of HPC)
 - 2 positions at DKRZ
 - 2 positions at JSC
 - Job vacancy still open
 - Work will start in March 2022
- ⇒ Will carry out the HPC support sprints as the actual core of the project



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Input 2: State of affairs: Governance and application configurations



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National ESM Initiative State of affairs:

Governance and Application Configurations

Roland Potthast, Markus Rapp und Michael Schulz



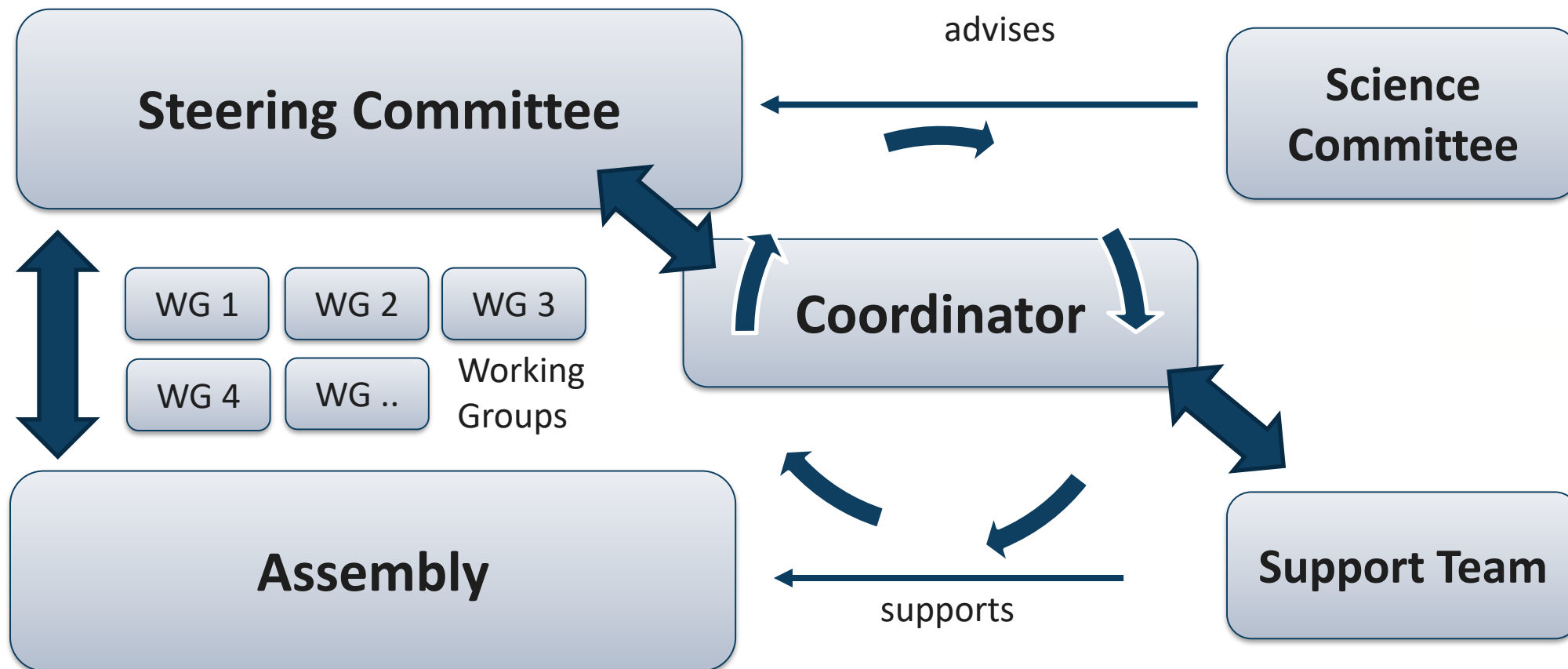
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National ESM Initiative Governance concept

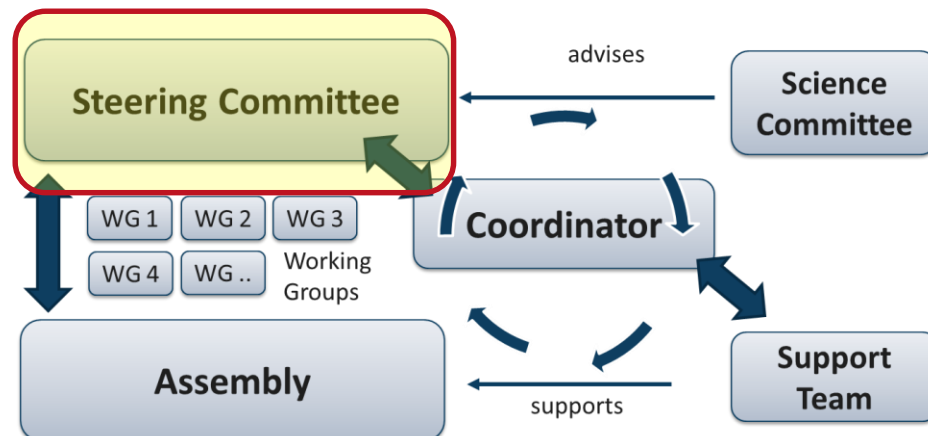
Governance Structure



National ESM Initiative Governance concept

Steering Committee

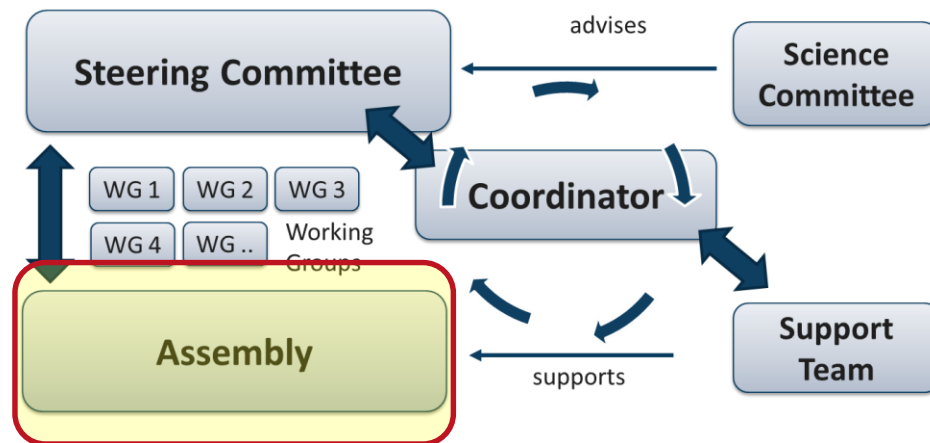
Steering Committee



- Definition **Strategy, Plan, Governance,**
- **Basic Configurations, Working Groups**
- Large Research Institutions represented
- **Universities** represented (involves **DFG**)
- *Community represented*
- *Core Components represented*
- **Institutional Responsibility** for the Complete System, ensure FTEs as Collective Effort
- **Develop Sustainable Concept**

National ESM Initiative Governance Concept

Assembly

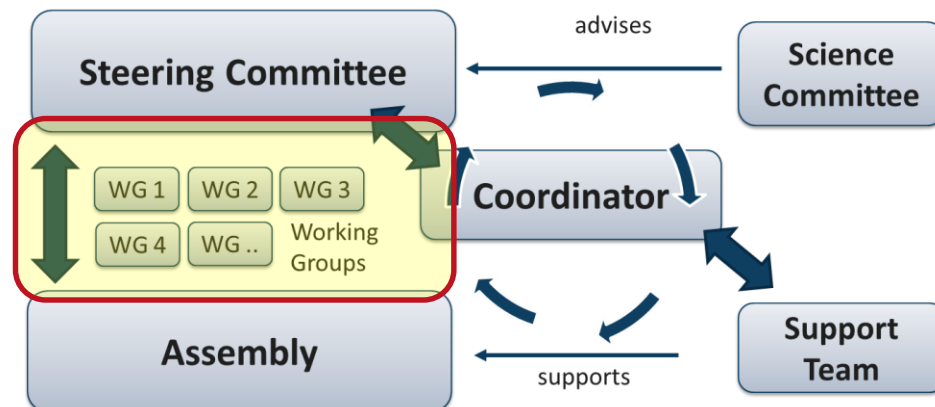


Assembly

- All **Partners**
- **Meetings** every 1-2 Years
- Organised by Steering Group and Support Team
- Important **Forum** for
*Science, Exchange,
System Development,
Impulses and Feedback*

National ESM Initiative Governance Concept

Working Groups



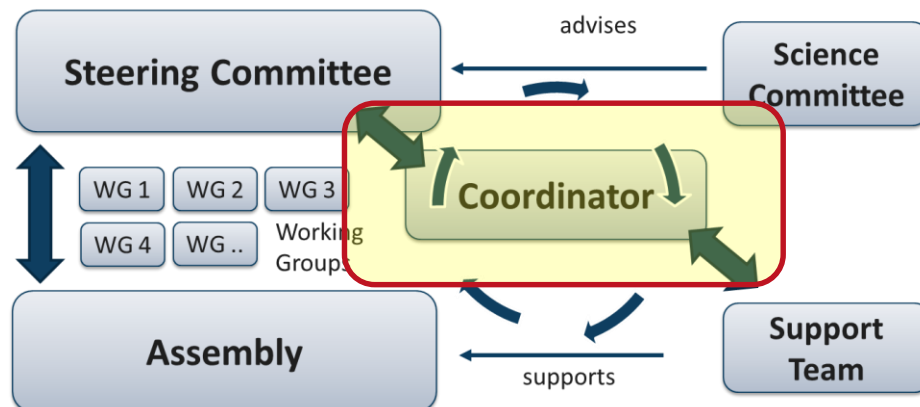
Working Groups (WG)

- Components of the ESM System
- Core Topics
- **WG Leader**
- WGs as flexible Tool
- Work out Details of **ESM**
- **Development Plan**
- **Coordination** of ESM Components and their Interfaces
- **WG-Meetings** coordinated by WG Leader
- **WG-Report** to Steering Committee

National ESM Initiative Governance Concept

Coordinator

Coordinator



- **Integrative** approach
- Ensures **coherent** development
- **Full-Time**
- **Sustainable** Staff Concept
- Financed by the **Institutions** of the Steering Committee
- **Flexibility** with respect to Third-Party funded Projects

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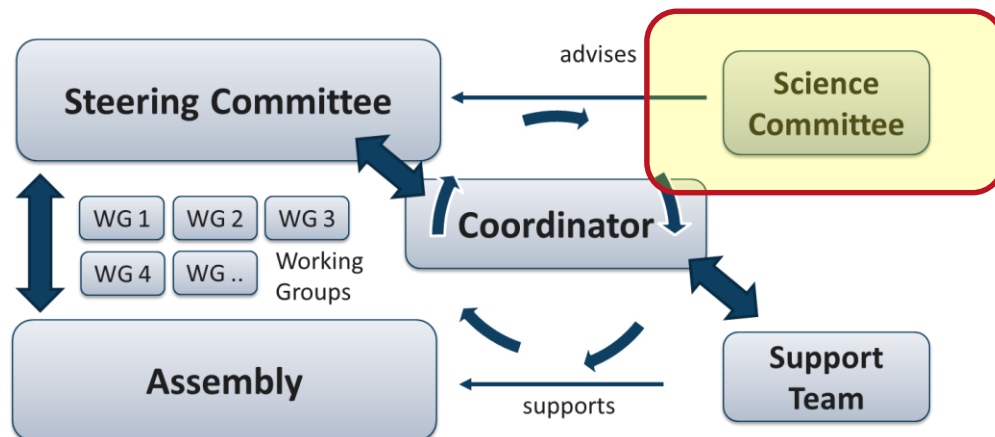
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Science Committee

(Details to be discussed)

Science Committee

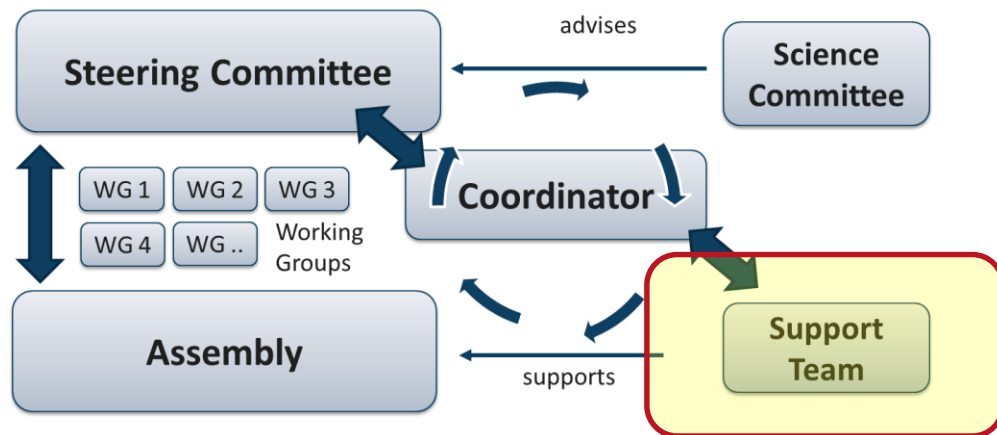


- **Advice and Input** for the Steering Committee, Working Groups, Coordinator and Support Team
- Reflect and ensure **state-of-the-art** development
- **Broad Involvement** of International Experts
- **Reviews** the concepts and activities
- **Feedback** and Critical Viewpoints

National ESM Initiative Governance Concept

Support Team

Support Team

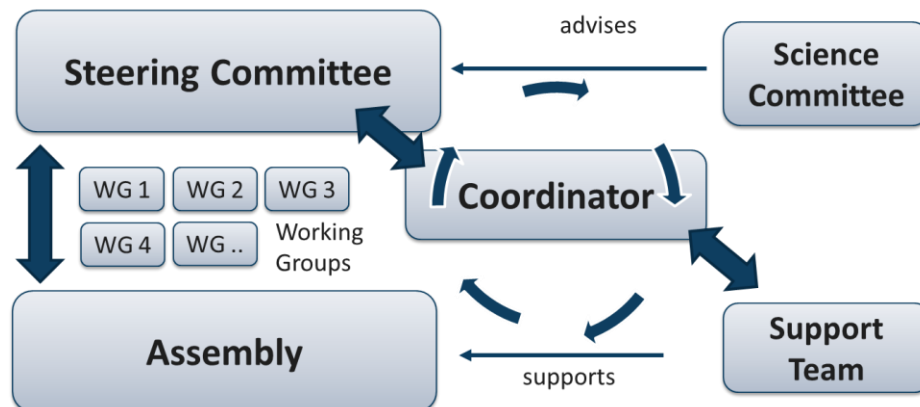


- Current **BMBF Sprints** –
Selection Process see separate Talk!
- **Integration** of the Components of the full ESM System
- **Quality Control**
- Management of **Git Repositories**
- **Advice** and **Help**
for Working Groups and ESM Components

National ESM Initiative Governance Concept

ESM Target Features

National ESM Target Features



- a. Well-defined interfaces between Earth system components
- b. Allows simulations from global to local
- c. Exascale-ready
- d. Scalable work flows
- e. Portability
- f. Modularity
- g. Data assimilation capacity
- h. Diagnostic capacity
- i. User friendly and well documented
- j. Traceability, reproducibility and version control
- k. Standardization
- l. License of useful open source type

National ESM Initiative Governance Concept

ESM Technical and Administrative Criteria and Endorsement

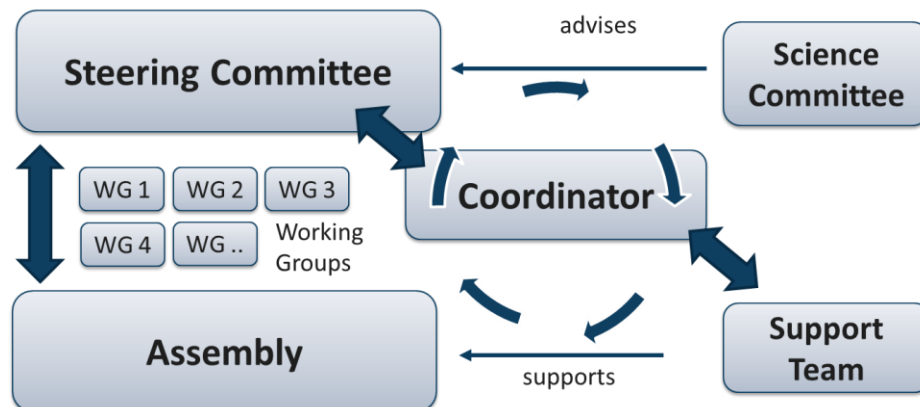
- **ESM Tech-Admin Criteria**

- Technical **Feasibility**
(Sprints support development)
- **Commitment** to Components:
contribute FTE's needed for Sustainability
- **Licences**: Component usable
for all partners and the community

- **Endorsement (ESM Components)**

- Application of Endorsement to Steering Committee
- **Peer Review Process** (3 Reports)
- **Decision** by Steering Committee

Later in the process

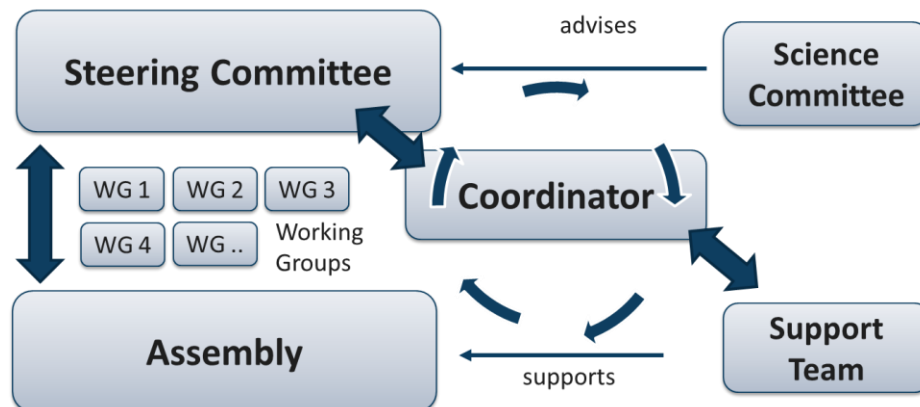


National ESM Initiative Scientific Questions

As the basis for the ESM Strategy

Exemplary Topic Areas:

- Basic understanding of Earth-system processes
- Climate extremes and natural hazards
- Impacts of climate change, mitigation and adaptation strategies
- Global biogeochemical cycles
- Resource use
- Human-environment interaction
- Subseasonal-to-decadal forecasts
- Climate-engineering approaches



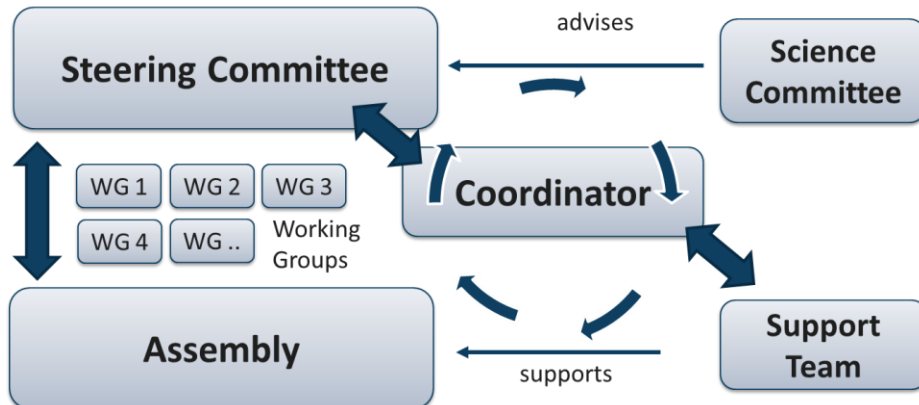
National ESM Initiative Earth System configurations

of the ESM strategy (non exhaustive)

A flexible infrastructure enabling configurations which allow resolution, length of simulation, complexity, and quantification of uncertainty to be tailored to the specific scientific question or application.

- Configurations for weather forecasting
- Global high-resolution (~1km) configurations for coupled simulations (atmosphere, land and ocean)
- Global configurations with coupled high-resolution regional and local impact models (up to 0.1 km)
- Flexible configurations for paleo-climate states
- Medium resolution simulations (0.5 bis 2 degrees), e.g., suitable for chemistry climate simulations or long climate runs
- Integration of new geophysical components (e.g. ice sheets incl. geodynamics)
- Integration of socio-economic models

→ No predetermination of components
of the ESM strategy



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Input 3: Decision-making process for selecting sprints



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National ESM Support Team How to handle RFS (Request For Support)?



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Request for Support

Who is allowed to request?

- German research institutions in Earth System Modelling

What can be requested?

- Consultancy / exploratory requests
- Dedicated HPC-Support

Minimum scope of the request

- Abstract containing research question and objectives
- Type of request - exploration or realisation
- Previous results and justification of request
- Deadline to complete request + duration estimated by user



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Request for Support



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What natESM support team will do

- RSEs take over for a certain period of time
 - Mainly virtual but also on site for some days
 - Milestones and goals must be defined at the beginning
 - Final report to allow for review and dissemination of results
- Coordination will bundle requests and work out commonalities for a cross-model strategy

Types of Request

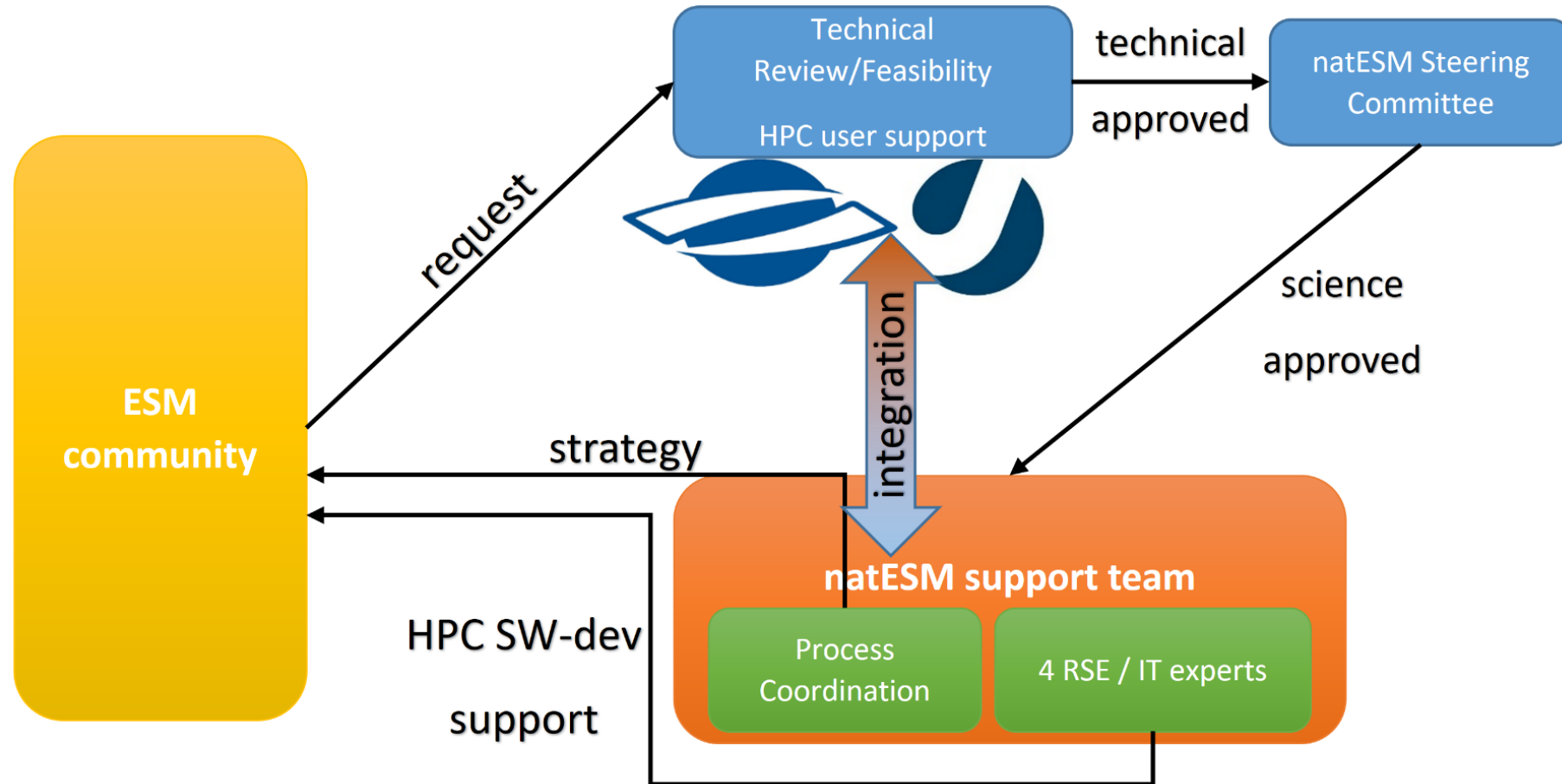
Exploration

- Preliminary assessment [1-2 weeks]
- Suitable to define the problem more precisely in cooperation between user(s) and supporters
- Roughly estimate the scope/feasibility
- Define goals more precisely before requesting a 'realisation'

Realisation

- Specific implementation [3-6 months]
- Implement/rewrite (parts of) an ESM component to achieve a certain target
- Cooperation with local developer team to integrate ESM component into natESM strategy [later in the course of the project]

Pillars of RFS System



Assessment Procedure

1. RFS raised

⇒ Application has to follow a certain form - to be defined

2. Technical review

- a. Technical readiness of code
- b. Feasibility to achieve proposed goals
- c. Consistency with the natESM modelling properties (like OpenSource, Version Control, Portability, ...)

⇒ Done by support team (plus external referees if needed)

Assessment Procedure

3. Scientific review

- a. Scientific quality and/or novelty of model
- b. Impact of the model
- c. Consistency with the natESM modelling properties (like well-defined interfaces, allowing for local to global simulations, ...)

⇒ Done by e.g. 2 reviewers (possibly internally from the Steering Committee or experts in the community)

4. Final decision by Steering Committee

Summary/Review After Sprints

Short report on the outcome and next steps:

- Goal achieved?
- List of main obstacles
- Lessons learned for other requests
- ESM component in line with strategy

⇒ Done by natESM coordination

Resources

- Coordination + assistance
 - Overseeing main aspects of natESM strategy together with natESM steering group;
Organising meeting/workshops
- 4x RSE (Research Software Engineers)
 - Technical implementation of HPC support; located at DKRZ & JSC
- Technical review/feasibility
 - DKRZ, JSC (+ other experts) for first review on “HPC-readiness” and estimation of work
- natESM steering committee
 - Scientific review of requests
 - Responsible for the natESM strategy as a whole



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**Thank you for your participation
and see you in February**



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