EUROPEAN FOREST INSTITUTE

Grant submission guidelines

G-04-2025

Pilots of long-term climate impact forest monitoring sites:

Providing temporally resolved ecosystem-level information on the effects of climatic drivers on forest structure and function in near real-time

1. ACTIVITY TO BE SUPPORTED BY THE GRANT

Introduction

European forests cover more than 1/3 of the land area and play a vital role in Europe's environment, economy, and society. Forests provide many benefits to society regarding climate regulation, raw materials, habitats for biodiversity, and many other services. Climate change is a major challenge to European forests, as demonstrated by recent heat waves, extended drought periods and disturbances (storms, wildfires, insect outbreaks). Climate change may lead to shifts in tree species ranges, changes in forest productivity, tree mortality and increased disturbance damage. Hence, it is essential to assess the extent of the impact of ongoing climate change on the functioning of trees and forests.

Forest inventories are important to assess the impact of climate change on forests over longer time periods. Past and recent changes in forest structures and functioning can be analysed with data from large long-term forest monitoring programs such as ICP Forests[1], the national forest inventory (NFI) networks[2,3] or - in parts - networks such as ICOS[4] and LTER[5]. For example, the ICP Forests network with a high number and broad spatial coverage of plots, where many tree-related parameters are measured with yearly or sub-yearly resolution, is a perfect basis for such assessments. However, when these monitoring sites were established, they focused mainly on assessing the impact of air pollution. They were not designed to provide close to real-time information on tree water and carbon relations. The same is also true for other forest monitoring networks.

With this call, we aim to increase the potential of forest monitoring sites, such as ICP Forests sites, to assess the impact of climate and climatic extremes on trees and forests by implementing measurements that allow assessing tree and forest functioning in close-to-real time.

Objectives and outcomes

FORWARDS is a Horizon Europe project that will prototype the ForestWard Observatory, a pan-European monitoring and evaluation tool that will help demonstrate climate change's impact on forests, guiding decision-making for practical forest management. As part of its activities, FORWARDS will establish a network of pilot monitoring plots/sites to assess the long-term impact of climate change on forest ecosystems. These pilot plots/sites need to be linked to existing forest monitoring networks and provide spatial representativeness, as explained in detail below.

The call for pilots of long-term climate impact forest monitoring sites is closely linked to work package 2 of FORWARDS, which is implementing novel monitoring techniques at existing forest monitoring sites. High-resolution dendrometer measurements are central and can capture complex signals integrating tree stem irreversible growth and reversible radial fluctuations due to stem water release and refill. Sub-daily measurements of stem diameter variations from dendrometers will provide valuable in situ metrics on the long-term physiological response of trees to changing climate in terms of growth and water status[38]. Together with measurements of soil moisture availability and meteorological parameters, impacts of extreme heat and drought events and effects of other disturbances on growth and water relations and growth phenology will be captured. Combined with modelling approaches, regional scale nowcasting tools for stress and stress impact are being established. Forest structural features assessed by LIDAR or classical forest mensuration are central to understanding the forest C stock and the C sequestration potential. Such information must also be linked to satellite products that allow spatial extrapolation.

One of the major aims of FORWARDS is to develop a stress now-casting network. The primary aim of this call for grants is to support activities engaging in additional measurements and providing long-term data on forest functioning and forest disturbance impacts to understand better the impact of climate change on various time scales. Results and data from these measurements will contribute to the Europe-wide ForestWard Observatory. Thus, the funded projects must allow for the integration of the data and the results generated into the broader scope of WP2 of FORWARDS as described above.

Supported projects and activities

Succesful grant applications (and supported projects) must provide temporally resolved ecosystem-level information on the effects of climatic drivers on forest structure and function in near real-time.

The aim of the call follows the concept of " linking methods", as described in detail by Zweifel *et al.* 2023[6] where a handful of standardised methods for meteorological as well as soil- and tree-related parameters provide a data framework along which site-specific measurements can be scaled.

The projects supported by these grants are encouraged to follow the methods detailed below to provide information with novel and improved measurements and sensors on forest disturbances and status related to climate change based on complementary ground-based sensors for **Stress nowcasting (soil and tree ecophysiological data)** together with information on the carbon sequestration potential of forests (**Carbon storage and stand structural information)**.

Data and results from the supported activities must be available for open access in a close-to-real time frame for stress nowcasting and feed into the ForestWard Observatory developed by the FORWARDS project.

Stress nowcasting might provide novel information on the impacts of climate change on forest functioning only after some time. Proposals must, therefore, include a plan (incl. funding) that elaborates how the measurements will be continued for a minimum of three years beyond the project's duration.

Guidance on approach and methods

Projects are encouraged to ensure that not only small single sites can be equipped with point dendrometers but that the design considers a larger spatial representativeness for a given biogeographical region (i.e., covering several sites within an area of 20-100 km^2).

Projects are encouraged to establish supersites (s. Fig 1) on highly equipped forest monitoring sites (e.g., ICP Forest level II plots) plus additional (less equipped) supporting sites surrounding the supersites (e.g., ICP Forests Level I sites) and integrate them into the FORWARDS forest monitoring network and the spatial design will be an evaluation criterion. In this context, Supersites are defined as forest monitoring sites with multiple information layers measured on the ground and with proximate sensing for capturing canopy dynamics and water and carbon cycling with high temporal resolution and near-real-time data delivery for better integration with RS time series. In ICP Forests Level II sites, many different measurements related to tree growth and water and nutrient relations are carried out continuously, building a prerequisite for the establishment of a supersite within the FORWARDS project. The availability of such measurements is also given at other sites and/or networks, which might have another focus (e.g., ICOS, LTER) and then qualify for

the establishment of supersites. Long-term growth measurements, soil water availability and nutrient availability must be available (and comply with the methods defined in the ICP Forest[1] or ICOS[2] manuals.

Highly equipped forest monitoring sites, where high temporal resolution tree functioning measurements are not standard, can qualify as candidates for super sites. Additional close-to-real-time measurements of tree water deficit and growth with point dendrometers[7] , as well as of soil moisture and matric potential sensors together with soil properties (texture, coarse fragment content, humus content, bulk density) carried out with the funding available from this call will allow to qualify these sites as supersites and to integrate these sites into a network of pilot supersites (Fig. 1). The Europe-wide pilot supersite network will then enable nowcasting of climate change effects and disturbances on forests on a European scale. Such a supersite framework, as established in FORWARDS, will provide data that will feed into a Bayesian nowcasting model framework.

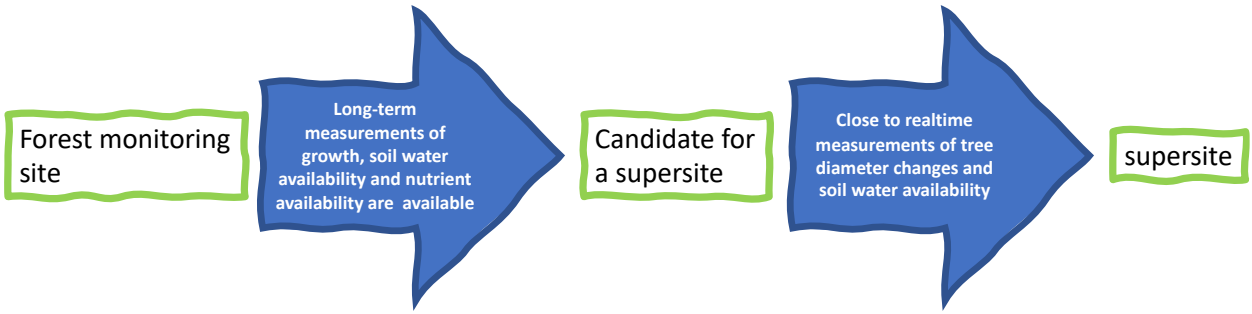

Fig. 1: Minimal requirements for a supersite within the FORWARDS supersite pilot framework

Suppose soil moisture and matric potential measurements are already available at given sites (and they qualify as supersites according to Fig 1). In that case, we suggest including these sites but developing a few additional forest monitoring sites into supersites. At the supersites (as defined for their minimal requirements in Fig 1), additional repeated measurements on forest structure (e.g., height and diameter measurements of trees, terrestrial laser scans) might be performed and these measurements should also be conducted on **additional (typically less equipped) supporting sites surrounding the supersites (e.g., ICP Forests Level I sites** or sites by other monitoring networks)**.**

Forest monitoring sites (at least two sites that have the status of a candidate supersite; Fig 1) will be equipped with standardised sensors as described for TreeNet – the biological drought and growth indicator network[7] and will thus qualify as supersites according to Fig. 1) Fig. 2 shows as an example different measurements at a supersite that can also include remote sensing. The set of sensors in the soil, air and tree are considered to follow the linking methods concept[6] and are meant to provide a link between the existing (heterogenous) infrastructure at the various sites and the FORWARDS nowcasting network depending on homogenous, standardised data.

The linking methods include:

- point dendrometers on tree stems (3-5 trees per tree species, coverage of the most important tree species in the stand; if the stand contains only one dominant species, more than 3-5 sensors should be installed for this given species),

[1] http://icp-forests.net/page/icp-forests-manual

[2] http://www.icos-etc.eu/icos/documents/instructions

- soil water potential sensors (or, however, less preferable soil moisture sensors) in at least two depths (topsoil and deeper soil layer (e.g., 50 cm but depending on local soil conditions)
- temperature sensors in a soil profile (recommended to be defined according to the soil and rooting zone depth to ensure that for a given soil profile, a justifiable depth profile is covered)
- air temperature and relative air humidity sensors.

All these sensors can be linked to a LoRaWAN data transfer device (see details in Zweifel et al. 2021[7]) to send the data in near real-time to a central data server compatible with the infrastructure currently run in TreeNet-Switzerland. The FORWARDS team at WSL in Switzerland will extend its server structure so that the data provided by the grantees will feed into a joint database, as described in detail by Zweifel et al. 2021[7]. With such a homogenous infrastructure, data can be brought into a European-wide context and assimilated into a drought impact nowcasting framework. Such a compatible infrastructure is necessary to allow close to real-time data transfer and processing.

Successful applicants/projects are expected to suggest ways of how to relate and scale the already existing site-specific measurements (e.g., eddy-covariance based fluxes, alternative ways of growth and biomass measurements, own soil water status measurements, vitality indices, etc.) with the help of the linking methods to the European scale (see Zweifel et al. 2023[6]). We further encourage integrating suggestions for method synchronisation approaches (e.g., for existing dendrometers and soil measurements) into the applications. We strongly advise following the equipment suggestions mentioned above so that homogenous data sets can be generated. These datasets can then contribute (without temporal delay) to European-wide nowcasting models that will be established in FORWARDS.

For structural assessments of forests, we suggest two different methods that might be combined. Moreover, these measurements should be performed on the supersites (see Fig. 1) as well as on the additional sites (e.g., ICP Forests Level I) that provide the spatial representativeness for a given region to link later within FORWARDS to satellite based remote sensing.

A) Tree height and diameter measurements: Tree diameter and height are regularly assessed every five years in ICP Forest Level 2 sites and also at regular intervals on other sites that can qualify for supersites (e.g., ICOS, (e)LTER). Further annual assessments on the supersites and one-time measurements on the additional sites (such as ICP Forests Level I sites) will increase the information on carbon stocks and the carbon sequestration potential of forests on a larger area scale. Such measurements should comply with the ICP Forests manual (http://icp-forests.net/page/icp-forests-manual).

B) 3D point clouds for structural information: Terrestrial laser scanning (TLS), Personal laser scanning (PLS), UAV-Lidar and/or point clouds from structure-from-motion based on high-resolution RGB UAV images and/or terrestrial images; all these technologies can measure a range of structural attributes of forest sites and an appropriate one should be applied. 3D point clouds should cover existing supersites and additional Level I sites and be referenced in absolute coordinate systems.

To acquire consistent information, the following data collection process is suggested:

- The suggested method for collecting 3D point clouds is terrestrial laser scanning (TLS). Laser scanner quality should at least be comparable with a Riegl VZ400i.
- The data should be collected very close to the time of the image spectroscopy flights and the field campaigns if methodological foci 2 and 3 are combined.

- The point clouds are absolutely referenced, and individual trees of the supersites and additional surrounding sites are segmented. Additional derived products (e.g., biomass) are encouraged.
- The FORWARDS partner at WSL can provide central coordination of activities by grantees across Europe.

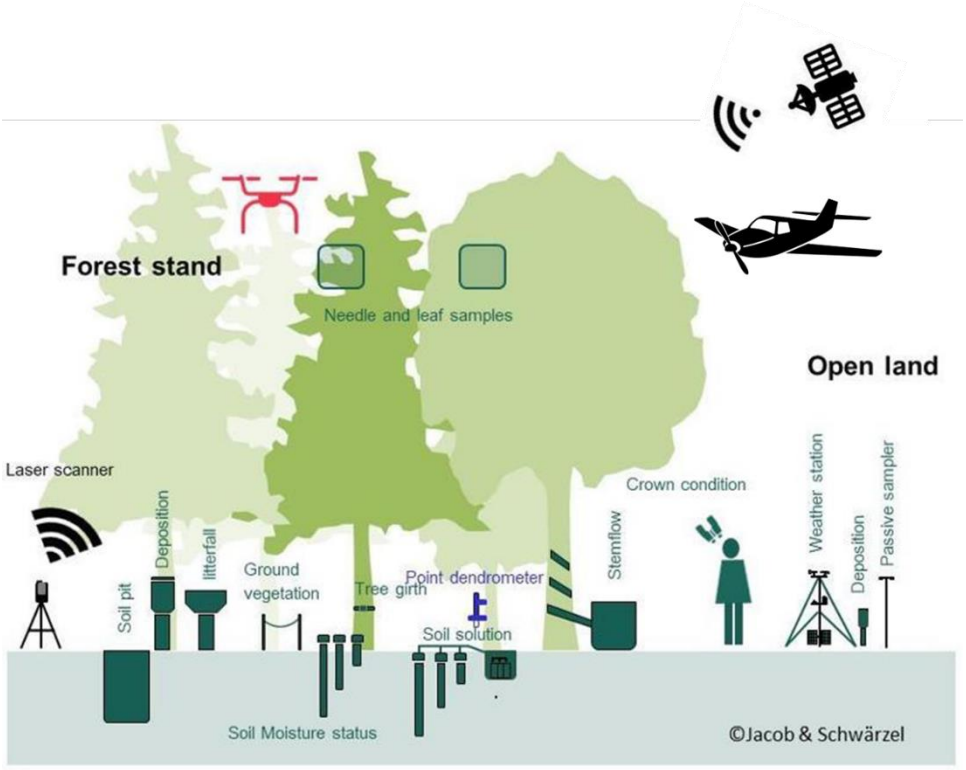

Fig 2: Set up of supersites on highly equipped forest monitoring sites that qualifies as a supersite (see for minimal requirements Fig 1).

Available funding

Proposals can request a contribution of max. 145,000 euro which will allow establishing infrastructure on existing monitoring plots where additional information on the impact of climate change on forests can be gained.

A maximum of 4 projects will be funded under this Call.

Projects are expected to start within the 2025 growing season (December 2025 the latest) so that at least part of the project can be monitored and last a maximum of 18 months. The activities must be completed at the latest May 2027, although with assured continuation of the nowcasting approaches for a minimum of three years.

To ensure that all European regions are covered, proposals must indicate the European and biogeographic region(s)[3] targeted by the project. European regions follow country groups as defined by Forest Europe in its State of Europe's Forests reports[4].

- Lot 1: North Europe
- Lot 2: Central Europe

[3] https://www.eea.europa.eu/data-and-maps/figures/biogeographical-regions-in-europe-2

[4] https://foresteurope.org/wp-content/uploads/2016/08/SoEF_2020.pd

- Lot 3: South Europe

It is possible to include gradients combining country groups from the different lots. It is then important that one focus area is defined by scientific criteria (i.e. it needs to be described why the main site(s) of a gradient is located in a given lot and why an extension of the gradient with (an) other site(s) across the borders of that lot is justified) to allow allocation to one of the lots.

References

1 George, J.-P. *et al.* Long-term forest monitoring reveals constant mortality rise in European forests. *Plant Biology* **24**, 1108-1119 (2022). https://doi.org/https://doi.org/10.1111/plb.13469

2 Bontemps, J.-D., Bouriaud, O., Vega, C. & Bouriaud, L. Offering the appetite for the monitoring of European forests a diversified diet. *Annals of Forest Science* **79**, 19 (2022). https://doi.org/10.1186/s13595-022-01139-7

3 Yu, Y. *et al.* Making the US national forest inventory spatially contiguous and temporally consistent. *Environmental Research Letters* **17**, 065002 (2022). https://doi.org/10.1088/1748-9326/ac6b47

4 Heiskanen, J. *et al.* The Integrated Carbon Observation System in Europe. *Bulletin of the American Meteorological Society* **103**, E855-E872 (2022). https://doi.org/https://doi.org/10.1175/BAMS-D-19-0364.1

5 Holmberg, M. *et al.* Modelling study of soil C, N and pH response to air pollution and climate change using European LTER site observations. *Science of The Total Environment* **640-641**, 387-399 (2018). https://doi.org/https://doi.org/10.1016/j.scitotenv.2018.05.299

6 Zweifel, R. *et al.* Networking the forest infrastructure towards near real-time monitoring – A white paper. *Science of The Total Environment* **872**, 162167 (2023). https://doi.org/https://doi.org/10.1016/j.scitotenv.2023.162167

7 Zweifel, R. *et al.* TreeNet–The Biological Drought and Growth Indicator Network. *Frontiers in Forests and Global Change* **4** (2021). https://doi.org/10.3389/ffgc.2021.776905

2. QUESTIONS

Questions regarding the grant process must only be sent to the following address:

forwards@efi.int

Questions can be sent until:

8 August 2025

Questions and answers for this grant process will be published at https://efi.int/grants-training/grants/G-04-2025

The following schedule will be followed for the publication of the Questions and answers:

- Answers for questions received during the period call launch-17 July 2025 will be published on 28 July 2025
- Answers for questions received during the period 18 July 2025 – 8 August 2025 will be published on 15August 2025

Individual questions will not be replied to separately.

Potential applicants are advised to visit https://efi.int/grants-training/grants/G-04-2025 regularly before the deadline for the submission of applications for any Q&A, and updates or modifications regarding this grant process.

3. ELIGIBILITY CRITERIA

Grant applications can be submitted by one legal entity or a consortium of legal entities.

Applicants must, by the deadline for submission of the Application, meet the following criteria to be eligible for the grant:

Criteria	Description of criteria	Clarification
E1	Applicant is a legal entity (legal person)	If the application is submitted by a consortium (grouping of legal persons represented by a coordinator), this criterion applies to all the participants This call is not open for applications from natural persons
E2	Applicant eligible for funding under the European Union Horizon Europe Research and Innovation Program	If the application is submitted by a consortium, this criterion applies to all the participants

Applications not fulfilling the above stated eligibility criteria will be rejected.

Furthermore, the following legal entities (legal persons) will not be eligible for funding:

- Beneficiary or associated partner of the FORWARDS project under the Grant Agreement No. 101084481
- Entities subject European Union restrictive measures
- Israeli entities due to activities in the territories occupied by Israel (European Commission Guidelines No 2013/C 205/05)

- Public interest trusts established under the Hungarian Act IX of 2021 or any entity maintained by such a public interest trust (Council Implementing Decision 2022/2506)
- Legal entities established in Russia, Belarus, or in non-government-controlled territories of Ukraine

4. ADMISSIBILITY REQUIREMENTS

All applications shall apply the following structure:

I. Administrative information
   i) Application Form - Part A, using template provided in annex 1

II. Technical Description
   i) Application Form - Part B, following Template annex 2
   ii) The length of the technical description must not exceed 12 pages and shall be submitted in one single PDF document (this does not include the instructions and guidance provided in annex 2).
   iii) Technical Description must be written in English

Formatting rules for the documentation under subsections I. and II.

- Font: Calibri
- Minimum font size: 11 pt (except for tables and figures where it should be minimum 10 pt)
- Line spacing: 1
- Orientation: Portrait. For the tables or any Gantt/pert chart, landscape orientation can be used if necessary for the purpose of fitting of the tables or for legibility.
- Page size and margins: Page size A4, all margins (top, bottom, left, right) should be at least 2 cm (not including any footers or headers)

All the documentation must be submitted in PDF format (Two separate pdfs for I. Administrative information and II. Technical Description).

What procedures to follow for applying:

Grant application shall only to be submitted by the applicant (coordinator as applicable) to:

grants@efi.int

Please note that it is not allowed to send the email to another recipient (i.e. not in the To: field, the cc: field, or the bcc: field)

The email with the application shall contain only the following heading in the subject line:

G-04-2025, Pilots of long-term climate impact forest monitoring sites: Providing temporall resolved ecosystem-level information on the effects of climatic drivers on forest structur and function in near real-time

The grant application must have been received by EFI by the following deadline at the latest:

24 August 2025 at 21:00 UTC +2

5. AWARD CRITERIA

Criteria that will be applied for awarding of the grant:

A1	**Excellence**	▪ Clarity and relevance of the objectives in relation to the call topic.

		▪ Soundness of the proposed methodology, including the underlying concepts, and assumptions. ▪ Spatial design that considers representativeness and scalability
A2	**Implementation**	▪ Quality, coherence, and effectiveness of the work plan, including extent to which the resources and tasks assigned are in line with the objectives of the activities. ▪ Complementarity of the participants and extent to which the consortium brings together the necessary expertise. ▪ Appropriateness of risk management.

Applications will receive a score of 0-5 for each criterion. Scores can be given in half points.

Applications must receive a score of at least 3.5 points in each of the categories A1 and A2 to be considered for a grant award and a total score of at least 8 points overall.

Applications are assigned into three lots according to the region in which the project is implemented: North Europe (Lot 1), Central Europe (Lot 2), South Europe (Lot 3).

Subject to applications meeting or exceeding the thresholds, at least one grant will be awarded in Lot 1, one grants in Lot 2 and two grants in Lot 3: the application(s) receiving the highest total score A1 + A2.

In case of equal scores within a lot, the following will apply: applications will be prioritised according to score under criteria A1, then A2. In case of equal scores under A1 and A2, applications will be prioritized according to gender balance in respect of the personnel that will primarily carry out the tasks in the project.

Should, if no application within a lot meets or exceeds the minimum threshold, overall call budget be available, the highest ranked application not selected for award of a grant will be selected (regardless of lot), and so forth, until overall call budget is no longer available.

6. GRANT DISBURSEMENT

EFI will disburse the grant in lump sum instalments (fixed sums):

- 35% entry into force of the grant agreement
- 25% upon approval of the interim technical report
- 40% upon approval of the final technical report

Applicants must, however, as part of the Application include the global amount needed to cover all implementation of the project.

7. GRANT AGREEMENT

Template grant agreement is provided as annex 3.
Please note that the Grant Agreement is only signed by EFI and the successful Applicant(s) (all Participating organizations) following decision by EFI on award of the Grant(s).

8. NEGOTIATION PHASE

In respect of applications selected for funding, further documentation to validate the legal and financial capacity of the Applicant, provided by and signed by the Applicant, may be required before EFI can sign the

grant agreement – as further instructed by EFI. If the requested documentation is not submitted within deadline set by EFI, EFI may in a new decision reject the application.

9. TERMS AND CONDITIONS FOR SUBMISSION OF AN APPLICATION

9.1 In addition to what has been stated in the Call for grant and these Grant submission guidelines, EFI applies the EFI Grant rules which have been made available at *https://efi.int/grants-training/grants/efi-grant-rules*

9.2 By submitting an application for a grant, the applicant accepts all the terms and conditions set out in the Call for grant and these Grant submission guidelines (including its annexes) and waives all other terms.

9.3 EFI may reject an application that is not in compliance with the instructions in the Call for grant or the Grant submission guidelines.

9.4 No information communicated in this grant process, including the Call for grant and these Grant submission guidelines (including its annexes), bind EFI in any way to an award or a grant agreement. EFI shall only be bound by written grant agreements.

9.5 An applicant must be able to prove to the satisfaction of EFI, any information given as part of its application. Failure to do so, within a time limit set by EFI, may result in rejection of the application.

9.6 EFI may ask the applicant for clarifications regarding any information submitted as part of the application. EFI may reject any applicant from the grant process that fails to submit the requested clarification.

9.7 Only applications sent to *grants@efi.int* will be considered.

9.8 Applications submitted after the deadline for submission will not be considered.

9.9 An Applicant may only submit one application. In case of multiple applications from the same economic operator EFI will only consider the last one received.

9.10 Withdrawal of an application shall be done in writing.

9.11 Information provided by the applicants cannot be considered confidential, unless so designated by EFI

9.12 All applications shall be quoted in Euros.

9.13 Expenses incurred in the preparation and dispatch of an application will not be reimbursed by EFI.

9.14 Applications must be legible. EFI may reject applications that are not legible.

9.15 EFI will disregard any information given by an Applicant outside the format for submission as stated in the Call for Grant or Grant submission guidelines.

9.16 The application shall be complete when submitted. EFI will disregard additional documentation or information submitted separately from the application, where not requested by EFI.

9.17 EFI may at its own discretion disclose the contents of any application, as well as information on the Beneficiary awarded the grant as well as any other information of the grant awarded.

9.18 Unless otherwise stated in the Call for grant and these Grant submission guidelines, the Application and all correspondence related to it shall be in English. EFI retains the right to correspond in English with the Applicant even if the application may be submitted in a language other than English.

9.19 Applicants are not entitled to contact EFI staff members, or any other person referred to in the EFI grant rules after the closing date of the receipt of applications to ask for information on the evaluation. EFI may eliminate from the evaluation any Applicant contravening this provision.

ANNEXES

- Annex 1: Application Form Part A
- Annex 2: Application Form Part B
- Annex 3: Grant Agreement Template