

Please check our [wiki](#) for help on navigating the form.

## Horizon 2020

### Call: H2020-MSCA-ITN-2020

(Marie Skłodowska-Curie Innovative Training Networks)

### Topic: MSCA-ITN-2020

### Type of action: MSCA-ITN-ETN

### Proposal number: 953015

### Proposal acronym: REVOLUTION

### Deadline Id: H2020-MSCA-ITN-2020

#### Table of contents

---

Section	Title	Action
1	General information	
2	Participants & contacts	
3	Budget	
4	Ethics	
5	Call-specific questions	

#### How to fill in the forms

The administrative forms must be filled in for each proposal using the templates available in the submission system. Some data fields in the administrative forms are pre-filled based on the steps in the submission wizard.

## 1 - General information

Topic MSCA-ITN-2020

Type of Action MSCA-ITN-ETN

Call Identifier H2020-MSCA-ITN-2020

Deadline Id H2020-MSCA-ITN-2020

Acronym **REVOLUTION**

Proposal title **A new generation of REsearchers to reVOLUtionise sustainable flood and drought risk soluTIONS**

*Note that for technical reasons, the following characters are not accepted in the Proposal Title and will be removed: < > " &*

Duration in months **48**

Panel **ENV - Environmental and Geosciences (ENV)**

*Please select up to 5 descriptors (and at least 3) that best characterise the subject of your proposal, in descending order of relevance. Note that descriptors will be used to support REA services in identifying the best qualified evaluators for your proposal.*

Descriptor1 **Natural hazards**

Descriptor2 **Hydrology, water management**

Descriptor3 **Scientific computing and data processing**

Descriptor4 **Human, economic and social geography**

Free keywords **Flood risk, drought risk, disaster risk reduction, socio-hydrology, hydrological extremes, new data sources, sustainable development goals, citizen science, participatory methods**

### Abstract\*

Between 2008-2018, floods and droughts affected over a billion people. Reducing flood and drought risk requires the ability to effectively monitor and assess risk. Yet, current scientific practice falls short. Currently, risk data and information are obtained from local studies or continental to global models. However, the time and expense of carrying out state-of-the-art local studies means they are limited to a few locations, whilst the coarseness of continental to global models limits their use locally or regionally. We aim to REVOLUTIONise society's ability to design and assess solutions to reduce flood and drought risk, through a high-level training, research, and networking programme. We do this by harnessing new and innovative ways of collecting data, which could complement more established data sources. Examples are: online media (e.g. Twitter) to monitor floods and droughts globally or provide warnings locally; drone observatories to fill the gap between sparse ground observations and coarse satellite data; OpenStreetMap to improve exposure mapping. This is achieved using new and innovative approaches for processing, analysing, and visualising these data, such as Cloud Computing, Citizen Science, and Machine Learning. We will develop a new network of networks to synergise emerging research activities on these topics, thereby allowing flood and drought risk monitoring and assessment to shift towards the so-called Fourth Paradigm of science, in which knowledge frontiers are pushed forward by new technologies. Our unique consortium includes academic, private, nongovernmental organisations. We will use an innovative Living-Lab approach, in which training, research, dissemination and communication are carried out through a co-creative process with stakeholders in a real-world setting. Through transdisciplinary and intersectoral training and research, our Early Stage Researchers will be able to gain employment in a range of sectors and positions.

Remaining characters

17

# Proposal Submission Forms

## Research Executive Agency

Proposal ID **953015**

Acronym **REVOLUTION**

Has this proposal (or a very similar one) been submitted to a previous ITN call in the last two years?  Yes  No

Please give the proposal reference or contract number

857807

# Proposal Submission Forms

Research Executive Agency

Proposal ID 953015

Acronym **REVOLUTION**

## Declarations

1) The coordinator declares to have the explicit consent of all applicants on their participation and on the content of this proposal.	<input checked="" type="checkbox"/>
2) The information contained in this proposal is correct and complete.	<input checked="" type="checkbox"/>
3) This proposal complies with ethical principles (including the highest standards of research integrity — as set out, for instance, in the <a href="#">European Code of Conduct for Research Integrity</a> — and including, in particular, avoiding fabrication, falsification, plagiarism or other research misconduct).	<input checked="" type="checkbox"/>
4) The coordinator confirms:	
- to have carried out the self-check of the financial capacity of the organisation on <a href="http://ec.europa.eu/research/participants/portal/desktop/en/organisations/lfv.html">http://ec.europa.eu/research/participants/portal/desktop/en/organisations/lfv.html</a> or to be covered by a financial viability check in an EU project for the last closed financial year. Where the result was “weak” or “insufficient”, the coordinator confirms being aware of the measures that may be imposed in accordance with the H2020 Grants Manual (Chapter on Financial capacity check); or	<input type="radio"/>
- is exempt from the financial capacity check being a public body including international organisations, higher or secondary education establishment or a legal entity, whose viability is guaranteed by a Member State or associated country, as defined in the H2020 Grants Manual (Chapter on Financial capacity check); or	<input checked="" type="radio"/>
- as sole participant in the proposal is exempt from the financial capacity check.	<input type="radio"/>
5) The coordinator hereby declares that each applicant has confirmed:	
- they are fully eligible in accordance with the criteria set out in the specific call for proposals; and	<input checked="" type="checkbox"/>
- they have the financial and operational capacity to carry out the proposed action.	<input checked="" type="checkbox"/>
The coordinator is only responsible for the correctness of the information relating to his/her own organisation. Each applicant remains responsible for the correctness of the information related to him and declared above. Where the proposal to be retained for EU funding, the coordinator and each beneficiary applicant will be required to present a formal declaration in this respect.	

### Note:

For **multi-beneficiary applications**, the coordinator vouches for its own organization and that all other participants confirmed their participation and compliance with conditions set out in the call. If the proposal is retained for funding, each participant will be required to submit a formal declaration of honour confirming this.

**False statements** or incorrect information may lead to administrative sanctions under the Financial Regulation 2018/1046.

**Personal data** will be collected, used and processed in accordance with Regulation 2018/1725 and the [Funding & Tenders Portal privacy statement](#).

Please be however aware that, to protect EU financial interests, your data may be transferred to other EU institutions and bodies and be registered in the EDES database. Data in the EDES database is also subject to Regulation 2018/1725 and the [EDES privacy statement](#).

## 2 - Participants & contacts

#	Participant Legal Name	Country	Action
1	STICHTING VU	NL	
2	TURUN YLIOPISTO	FI	
3	TECHNISCHE UNIVERSITEIT DELFT	Netherlands	
4	FUTUREWATER SL	ES	
5	STICHTING INTERNATIONAL RED CROSS RED CRESCENT CENTRE ON CLIMATE CHANGE AND DISASTER PREPAREDNESS	NL	
6	DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV	DE	
7	ALBERT-LUDWIGS-UNIVERSITAET FREIBURG	DE	
8	KING'S COLLEGE LONDON	UK	
9	ARDHI UNIVERSITY	TZ	
10	UPPSALA UNIVERSITET	SE	

### Information on partner organisations

Partner Organisation number	PIC <a href="#">Search PIC</a>	Organisation legal name	Country	Academic Sector	Role of associated		
					Provide training	Host secondments	
1	926929673	FloodTags	Netherlands	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	
2	905008740	Cloud to Street	United States	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	
3	897200046	Uhurulabs	Tanzania (United	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	
4	906446474	United Kingdom Research and Innova	United Kingdom	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	
5	913215716	Confederacion Hidrografica del Jucar	Spain	<input type="checkbox"/> No	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	
6	997769161	National Aeronautics and Space Admi	United States	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	
7	999992304	JRC -Joint Research Centre- Europea	Belgium	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	
8	920970866	Humanitarian OpenStreetMap Team U	United States	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	

Proposal Submission Forms  
Research Executive Agency

Proposal ID 953015

Acronym **REVOLUTION**

9	999520302	Stichting Deltares	Netherlands	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10	999655520	Barcelona Supercomputing Center - C	Spain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
11	953076217	United Nations International Strategy f	Switzerland	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

## 2 - Administrative data of participating organisations

### Coordinator

<b>PIC</b>	<b>Legal name</b>
954530344	STICHTING VU

Short name: VUA

#### Address

Street DE BOELELAAN 1105  
Town AMSTERDAM  
Postcode 1081 HV  
Country Netherlands  
Webpage www.vu.nl

#### Specific Legal Statuses

Legal person .....	yes	Academic Sector .....	yes
Public body .....	no		
Non-profit .....	yes		
International organisation .....	no		
International organisation of European interest .....	no		
Secondary or Higher education establishment .....	yes		
Research organisation .....	yes		

#### Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....2015 - no  
SME self-assessment ..... unknown  
SME validation sme.....2013 - no

# Proposal Submission Forms

## Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**

Short name **VUA**

### Department(s) carrying out the proposed work

#### Department 1

Department name

Institute for Environmental Studies (IVM)

not applicable

Same as proposing organisation's address

Street

DE BOELELAAN 1105

Town

AMSTERDAM

Postcode

1081 HV

Country

Netherlands

### Dependencies with other proposal participants

<b>Character of dependence</b>	<b>Participant</b>	



# Proposal Submission Forms

## Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**Short name **VUA**

### Person in charge of the proposal

Title 

Sex

 Male  FemaleFirst name **Philip**Last name **WARD**E-Mail **philip.ward@vu.nl**Position in org. Department 

Same as organisation name

 Same as proposing organisation's addressStreet Town Post code Country Website Phone Phone 2 

Fax

### Other contact persons

First Name	Last Name	E-mail	Phone
Marleen	de Ruiter	m.c.de.ruiter@vu.nl	+xxx xxxxxxxxxx
Rhian	Ebrey	rhian.ebrey@vu.nl	+xxx xxxxxxxxxx
Jeroen	Aerts	jeroen.aerts@vu.nl	+xxx xxxxxxxxxx
Dim	Coumou	d.coumou@vu.nl	+xxx xxxxxxxxxx
Hans	de Moel	hans.de.moel@vu.nl	+xxx xxxxxxxxxx
Karin	Rade	subsidiedesk@vumc.nl	+xxx xxxxxxxxxx

Proposal Submission Forms  
Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**

Short name **VUA**

## Participant

**PIC** 999903064  
**Legal name** TURUN YLIOPISTO

*Short name: UTU*

### Address

Street YLIOPISTONMAKI  
Town Turku  
Postcode 20014  
Country Finland  
Webpage www.utu.fi

### Specific Legal Statuses

Legal person .....yes  
Public body .....yes  
Non-profit .....yes  
International organisation .....no  
International organisation of European interest .....no  
Secondary or Higher education establishment .....yes  
Research organisation ..... yes  
Academic Sector .....yes

### Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....2012 - no  
SME self-assessment ..... unknown  
SME validation sme..... unknown

*Department(s) carrying out the proposed work*

**Department 1**

Department name

Geography and Geology

not applicable

Same as proposing organisation's address

Street

YLIOPISTONMAKI

Town

Turku

Postcode

20014

Country

Finland

*Dependencies with other proposal participants*

<b>Character of dependence</b>	<b>Participant</b>	

# Proposal Submission Forms

## Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**

Short name **UTU**

### Person in charge of the proposal

Title

Sex  Male  Female

First name **Niina**

Last name **Kayhko**

E-Mail **niina.kayhko@utu.fi**

Position in org.

Department

Same as organisation name

Same as proposing organisation's address

Street

Town

Post code

Country

Website

Phone

Phone 2

Fax

### Other contact persons

First Name	Last Name	E-mail	Phone
Tutkimus	Palvelut	tutkimuspalvelut@utu.fi	+xxx xxxxxxxxx

Proposal Submission Forms  
Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**

Short name **UTU**

## Participant

**PIC**

999977366

**Legal name**

TECHNISCHE UNIVERSITEIT DELFT

*Short name: DUT*

*Address*

Street STEVINWEG 1

Town DELFT

Postcode 2628 CN

Country Netherlands

Webpage www.tudelft.nl

*Specific Legal Statuses*

Legal person .....yes

Academic Sector .....yes

Public body .....yes

Non-profit .....yes

International organisation .....no

International organisation of European interest .....no

Secondary or Higher education establishment .....yes

Research organisation ..... yes

### Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....2018 - no

SME self-assessment .....2015 - no

SME validation sme..... unknown

# Proposal Submission Forms

## Research Executive Agency

Proposal ID 953015

Acronym

REVOLUTION

Short name DUT

### Department(s) carrying out the proposed work

#### Department 1

Department name

Water Management

not applicable

Same as proposing organisation's address

Street

STEVINWEG 1

Town

DELFT

Postcode

2628 CN

Country

Netherlands

### Dependencies with other proposal participants

<b>Character of dependence</b>	<b>Participant</b>	



# Proposal Submission Forms

## Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**Short name **DUT**

### Person in charge of the proposal

Title 

Sex

 Male  FemaleFirst name **Hessel**Last name **Winsemius**E-Mail **h.c.winsemius@tudelft.nl**Position in org. Department Same as  
organisation name Same as proposing organisation's addressStreet Town 

Post code

Country Website Phone 

Phone 2

Fax

### Other contact persons

First Name	Last Name	E-mail	Phone
Marie-Claire	ten Veldhuis	j.a.e.tenveldhuis@tudelft.nl	+xxx xxxxxxxxxx
Rolf	Hut	r.w.hut@tudelft.nl	+xxx xxxxxxxxxx
Christiaan	Tiberius	c.c.j.m.tiberius@tudelft.nl	+xxx xxxxxxxxxx
Oswaldo	Morales	o.moralesnapoles@tudelft.nl	+xxx xxxxxxxxxx

Proposal Submission Forms  
Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**

Short name **DUT**

## Participant

**PIC** 948139596 **Legal name** FUTUREWATER SL

*Short name: FW*

### Address

Street CALLE AZUCENA 23  
Town CARTAGENA  
Postcode 30205  
Country Spain  
Webpage www.futurewater.es

### Specific Legal Statuses

Legal person .....yes Academic Sector .....no  
Public body .....no  
Non-profit .....no  
International organisation .....no  
International organisation of European interest .....no  
Secondary or Higher education establishment .....no  
Research organisation ..... no

### Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....2013 - yes  
SME self-assessment .....2013 - yes  
SME validation sme..... unknown

# Proposal Submission Forms

## Research Executive Agency

Proposal ID 953015

Acronym

**REVOLUTION**

Short name **FW**

### Department(s) carrying out the proposed work

#### Department 1

Department name

Water, Food and Nature

not applicable

Same as proposing organisation's address

Street

CALLE AZUCENA 23

Town

CARTAGENA

Postcode

30205

Country

Spain

### Dependencies with other proposal participants

<b>Character of dependence</b>	<b>Participant</b>	

# Proposal Submission Forms

## Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**

Short name **FW**

### Person in charge of the proposal

Title

Dr.

Sex

Male  Female

First name **Johannes**

Last name **Hunink**

E-Mail **j.hunink@futurewater.es**

Position in org.

Department

Same as organisation name

Same as proposing organisation's address

Street

Town

Post code

Country

Website

Phone

Phone 2

Fax

## Participant

**PIC**

974802471

**Legal name**

STICHTING INTERNATIONAL RED CROSS RED CRESCENT CENTRE ON CLIMATE CHANGE AND

*Short name: RC*

*Address*

Street LEEGHWATERPLEIN 27

Town DEN HAAG

Postcode 2502 KC

Country Netherlands

Webpage <http://www.climatecentre.org>

*Specific Legal Statuses*

Legal person .....yes

Academic Sector .....no

Public body .....no

Non-profit .....yes

International organisation .....no

International organisation of European interest .....no

Secondary or Higher education establishment .....no

Research organisation ..... no

### Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....2011 - no

SME self-assessment ..... unknown

SME validation sme..... unknown

# Proposal Submission Forms

## Research Executive Agency

Proposal ID 953015

Acronym

**REVOLUTION**

Short name RC

### Department(s) carrying out the proposed work

#### Department 1

Department name

Climate Science and Urban Teams

not applicable

Same as proposing organisation's address

Street

LEEGHWATERPLEIN 27

Town

DEN HAAG

Postcode

2502 KC

Country

Netherlands

### Dependencies with other proposal participants

<b>Character of dependence</b>	<b>Participant</b>	

# Proposal Submission Forms

## Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**

Short name **RC**

### Person in charge of the proposal

Title

Sex  Male  Female

First name **Erin**

Last name **Coughlan de Perez**

E-Mail **coughlan@climatecentre.org**

Position in org.

Department   Same as organisation name

Same as proposing organisation's address

Street

Town  Post code

Country

Website

Phone  Phone 2  Fax

### Other contact persons

First Name	Last Name	E-mail	Phone
Maarten	van Aalst	vanaalst@climatecentre.org	+xxx xxxxxxxxx
Sanne	Hogesteeger	hogesteeger@climatecentre.org	+xxx xxxxxxxxx



Proposal Submission Forms  
Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**

Short name **RC**

## Participant

PIC	Legal name
999981731	DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV

Short name: DLR

### Address

Street Linder Hoehe  
Town KOELN  
Postcode 51147  
Country Germany  
Webpage www.dlr.de

### Specific Legal Statuses

Legal person .....	yes	Academic Sector .....	yes
Public body .....	no		
Non-profit .....	yes		
International organisation .....	no		
International organisation of European interest .....	no		
Secondary or Higher education establishment .....	no		
Research organisation .....	yes		

### Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....2007 - no  
SME self-assessment ..... unknown  
SME validation sme.....2007 - no

*Department(s) carrying out the proposed work*

**Department 1**

Department name

Land Surface Dynamics

not applicable

Same as proposing organisation's address

Street

Muenchener Str. 20

Town

Wessling

Postcode

82234

Country

Germany

*Dependencies with other proposal participants*

<b>Character of dependence</b>	<b>Participant</b>	

# Proposal Submission Forms

## Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**

Short name **DLR**

### Person in charge of the proposal

Title

Sex

Male  Female

First name **Mattia**

Last name **Marconcini**

E-Mail **mattia.marconcini@dlr.de**

Position in org.

Department

Same as organisation name

Same as proposing organisation's address

Street

Town

Post code

Country

Website

Phone

Phone 2

Fax

### Other contact persons

First Name	Last Name	E-mail	Phone
Sibel	Gur	sibel.guer@dlr.de	+xxx xxxxxxxxxx

Proposal Submission Forms  
Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**

Short name **DLR**

## Participant

<b>PIC</b>	<b>Legal name</b>
999841760	ALBERT-LUDWIGS-UNIVERSITAET FREIBURG

*Short name: ALU-FR*

### Address

Street FAHNENBERGPLATZ  
Town FREIBURG  
Postcode 79085  
Country Germany  
Webpage www.uni-freiburg.de

### Specific Legal Statuses

Legal person .....	yes	Academic Sector .....	yes
Public body .....	yes		
Non-profit .....	yes		
International organisation .....	no		
International organisation of European interest .....	no		
Secondary or Higher education establishment .....	yes		
Research organisation .....	yes		

### Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....2015 - no  
SME self-assessment ..... unknown  
SME validation sme..... unknown

# Proposal Submission Forms

## Research Executive Agency

Proposal ID 953015

Acronym

**REVOLUTION**

Short name ALU-FR

### Department(s) carrying out the proposed work

#### Department 1

Department name

Faculty of Environment and Natural Resources

not applicable

Same as proposing organisation's address

Street

Friedrichstr. 39

Town

Freiburg

Postcode

79098

Country

Germany

### Dependencies with other proposal participants

<b>Character of dependence</b>	<b>Participant</b>	

# Proposal Submission Forms

## Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**

Short name **ALU-FR**

### Person in charge of the proposal

Title

Sex

Male

Female

First name **Kerstin**

Last name **Stahl**

E-Mail **kerstin.stahl@hydrology.uni-freiburg.de**

Position in org.

Department

Same as organisation name

Same as proposing organisation's address

Street

Town

Post code

Country

Website

Phone

Phone 2

Fax

### Other contact persons

First Name	Last Name	E-mail	Phone
Christian	Jager	christian.jager@zv.uni-freiburg.de	+xxx xxxxxxxxxx
Inge	de Graaf	inge.de.graaf@hydrology.uni-freiburg.de	+xxx xxxxxxxxxx



Proposal Submission Forms  
Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**

Short name **ALU-FR**

## Participant

<b>PIC</b>	<b>Legal name</b>
999981052	KING'S COLLEGE LONDON

*Short name: KCL*

### Address

Street STRAND  
Town LONDON  
Postcode WC2R 2LS  
Country United Kingdom  
Webpage www.kcl.ac.uk

### Specific Legal Statuses

Legal person .....	yes	Academic Sector .....	yes
Public body .....	yes		
Non-profit .....	yes		
International organisation .....	no		
International organisation of European interest .....	no		
Secondary or Higher education establishment .....	yes		
Research organisation .....	yes		

### Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....2007 - no  
SME self-assessment ..... unknown  
SME validation sme.....2007 - no

# Proposal Submission Forms

## Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**

Short name **KCL**

### Department(s) carrying out the proposed work

#### Department 1

Department name

Geography

not applicable

Same as proposing organisation's address

Street

STRAND

Town

LONDON

Postcode

WC2R 2LS

Country

United Kingdom

### Dependencies with other proposal participants

<b>Character of dependence</b>	<b>Participant</b>	

# Proposal Submission Forms

## Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**

Short name **KCL**

### Person in charge of the proposal

Title

Sex

Male  Female

First name **Faith**

Last name **Taylor**

E-Mail **faith.taylor@kcl.ac.uk**

Position in org.

Department

Same as organisation name

Same as proposing organisation's address

Street

Town

Post code

Country

Website

Phone

Phone 2

Fax

### Other contact persons

First Name	Last Name	E-mail	Phone
Michael	Chadwick	michael.chadwick@kcl.ac.uk	+xxx xxxxxxxxxx
Valentina	Lotti	valentina.lotti@kcl.ac.uk	+xxx xxxxxxxxxx

Proposal Submission Forms  
Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**

Short name **KCL**

## Participant

**PIC** 999605953  
**Legal name** ARDHI UNIVERSITY

*Short name: ARU*

### Address

Street ARDHI UNIVERSITY  
Town DAR ES SALAAM  
Postcode -  
Country Tanzania (United Republic of)  
Webpage

### Specific Legal Statuses

Legal person .....	yes	Academic Sector .....	yes
Public body .....	yes		
Non-profit .....	yes		
International organisation .....	no		
International organisation of European interest .....	no		
Secondary or Higher education establishment .....	no		
Research organisation .....	yes		

### Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status..... unknown  
SME self-assessment .....

SME validation sme..... unknown

# Proposal Submission Forms

## Research Executive Agency

Proposal ID 953015

Acronym

**REVOLUTION**

Short name **ARU**

### Department(s) carrying out the proposed work

#### Department 1

Department name

School of Spatial Planning and Social Sciences

not applicable

Same as proposing organisation's address

Street

University Road

Town

Dar es Salaam

Postcode

00255

Country

Tanzania (United Republic of)

### Dependencies with other proposal participants

<b>Character of dependence</b>	<b>Participant</b>	

# Proposal Submission Forms

## Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**

Short name **ARU**

### Person in charge of the proposal

Title

Sex  Male  Female

First name **Ally**

Last name **Namangaya**

E-Mail **namangaya@aru.ac.tz**

Position in org.

Department

Same as organisation name

Same as proposing organisation's address

Street

Town

Post code

Country

Website

Phone

Phone 2

Fax

### Other contact persons

First Name	Last Name	E-mail	Phone
Evaristo	Liwa	everistliwa@gmail.com	+xxx xxxxxxxxxx
Joseph	Mayunga	mayungax@gmail.com	+xxx xxxxxxxxxx
Job	Chaula	jobchaula@gmail.com	+xxx xxxxxxxxxx



Proposal Submission Forms  
Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**

Short name **ARU**

## Participant

**PIC** 999985029 **Legal name** UPPSALA UNIVERSITET

*Short name: UU*

### Address

Street VON KRAEMERS ALLE 4

Town UPPSALA

Postcode 751 05

Country Sweden

Webpage www.uu.se

### Specific Legal Statuses

Legal person .....yes

Public body .....yes

Non-profit .....yes

International organisation .....no

International organisation of European interest .....no

Secondary or Higher education establishment .....yes

Research organisation ..... yes

Academic Sector .....yes

### Enterprise Data

Based on the below details from the Beneficiary Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status.....2015 - no

SME self-assessment .....2015 - no

SME validation sme.....2007 - no

# Proposal Submission Forms

## Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**

Short name **UU**

### Department(s) carrying out the proposed work

#### Department 1

Department name

Earth Sciences

not applicable

Same as proposing organisation's address

Street

Villavagen 16

Town

Uppsala

Postcode

75236

Country

Sweden

### Dependencies with other proposal participants

<b>Character of dependence</b>	<b>Participant</b>	

# Proposal Submission Forms

Research Executive Agency

Proposal ID **953015**

Acronym

**REVOLUTION**

Short name **UU**

## Person in charge of the proposal

Title

Sex  Male  Female

First name **Giuliano**

Last name **Di Baldassarre**

E-Mail **giuliano.dibaldassarre@geo.uu.se**

Position in org.

Department

Same as organisation name

Same as proposing organisation's address

Street

Town

Post code

Country

Website

Phone

Phone 2

Fax

# Proposal Submission Forms

Research Executive Agency

Proposal ID **953015**

Acronym **REVOLUTION**

## 3 - Budget

Researcher Number	Recruiting Participant (short name)	Planned start month	Duration (months)
1	DUT	9	36
2	KCL	9	36
3	ARU	9	36
4	UTU	9	36
5	RC	9	36
6	ALU-FR	9	36
7	UU	9	36
8	FW	9	36
9	VUA	9	36
10	FW	9	36
11	VUA	9	36
12	DLR	9	36

# Proposal Submission Forms

Research Executive Agency

Proposal ID **953015**

Acronym **REVOLUTION**

Researcher Number	Recruiting Participant (short name)	Planned start month	Duration (months)
13	DUT	9	36
14	DLR	9	36
15	UTU	9	36
<b>Total</b>			<b>540</b>

Participant Number	Organisation Short Name	Country	IOEI	No of researchers	Number of person.months	Researcher Unit Cost			Institutional Unit Cost		TOTAL
						Living allowance	Mobility Allowance	Family Allowance	Research, training and networking costs	Management and overheads	
1	VUA	Netherlands	no	2	72	254039,76	43200,00	18000,00	129600,00	86400,00	531239,76
2	UTU	Finland	no	2	72	284411,52	43200,00	18000,00	129600,00	86400,00	561611,52
3	DUT	Netherlands	no	2	72	254039,76	43200,00	18000,00	129600,00	86400,00	531239,76
4	FW	Spain	no	2	72	224609,76	43200,00	18000,00	129600,00	86400,00	501809,76
5	RC	Netherlands	no	1	36	127019,88	21600,00	9000,00	64800,00	43200,00	265619,88
6	DLR	Germany	no	2	72	228376,80	43200,00	18000,00	129600,00	86400,00	505576,80
7	ALU-FR	Germany	no	1	36	114188,40	21600,00	9000,00	64800,00	43200,00	252788,40

# Proposal Submission Forms

Research Executive Agency

Proposal ID **953015**

Acronym **REVOLUTION**

Participant Number	Organisation Short Name	Country	IOEI	No of researchers	Number of person.months	Researcher Unit Cost			Institutional Unit Cost		TOTAL
						Living allowance	Mobility Allowance	Family Allowance	Research, training and networking costs	Management and overheads	
8	KCL	United Kingd	no	1	36	164572,56	21600,00	9000,00	64800,00	43200,00	303172,56
9	ARU	Tanzania (U	no	1	36	76988,88	21600,00	9000,00	64800,00	43200,00	215588,88
10	UU	Sweden	no	1	36	143382,96	21600,00	9000,00	64800,00	43200,00	281982,96
Total				15	540	1871630,28	324000,00	135000,00	972000,00	648000,00	3950630,28

### 4 - Ethics

1. HUMAN EMBRYOS/FOETUSES		Page
Does your research involve <a href="#">Human Embryonic Stem Cells (hESCs)</a> ?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does your research involve the use of human embryos?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does your research involve the use of human foetal tissues / cells?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
2. HUMANS		Page
Does your research involve human participants?	<input checked="" type="radio"/> Yes <input type="radio"/> No	52
Are they volunteers for social or human sciences research?	<input checked="" type="radio"/> Yes <input type="radio"/> No	52
Are they persons unable to give informed consent?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Are they vulnerable individuals or groups?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Are they children/minors?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Are they patients?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Are they healthy volunteers for medical studies?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does your research involve physical interventions on the study participants?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
3. HUMAN CELLS / TISSUES		Page
Does your research involve human cells or tissues (other than from Human Embryos/ Foetuses, i.e. section 1)?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
4. PERSONAL DATA		Page
Does your research involve personal data collection and/or processing?	<input checked="" type="radio"/> Yes <input type="radio"/> No	53
Does it involve the collection and/or processing of sensitive personal data (e.g: health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does it involve processing of genetic information?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does it involve tracking or observation of participants?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does your research involve further processing of previously collected personal data (secondary use)?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
5. ANIMALS		Page
Does your research involve animals?	<input type="radio"/> Yes <input checked="" type="radio"/> No	



# Proposal Submission Forms

Research Executive Agency

Proposal ID 953015

Acronym **REVOLUTION**

6. THIRD COUNTRIES		Page
In case non-EU countries are involved, do the research related activities undertaken in these countries raise potential ethics issues?	<input checked="" type="radio"/> Yes <input type="radio"/> No	53
Tanzania (beneficiary and partner organisation) & United States of America (partner organisations)		
Do you plan to use local resources (e.g. animal and/or human tissue samples, genetic material, live animals, human remains, materials of historical value, endangered fauna or flora samples, etc.)?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Do you plan to import any material - including personal data - from non-EU countries into the EU?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Do you plan to export any material - including personal data - from the EU to non-EU countries?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
In case your research involves <a href="#">low and/or lower middle income countries</a> , are any benefits-sharing actions planned?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Could the situation in the country put the individuals taking part in the research at risk?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
7. ENVIRONMENT & HEALTH and SAFETY		Page
Does your research involve the use of elements that may cause harm to the environment, to animals or plants?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does your research deal with endangered fauna and/or flora and/or protected areas?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does your research involve the use of elements that may cause harm to humans, including research staff?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
8. DUAL USE		Page
Does your research involve dual-use items in the sense of Regulation 428/2009, or other items for which an authorisation is required?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
9. EXCLUSIVE FOCUS ON CIVIL APPLICATIONS		Page
Could your research raise concerns regarding the exclusive focus on civil applications?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
10. MISUSE		Page
Does your research have the potential for misuse of research results?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
11. OTHER ETHICS ISSUES		Page
Are there any other ethics issues that should be taken into consideration? Please specify	<input type="radio"/> Yes <input checked="" type="radio"/> No	

# Proposal Submission Forms

## Research Executive Agency

Proposal ID **953015**

Acronym **REVOLUTION**

I confirm that I have taken into account all ethics issues described above and that, if any ethics issues apply, I will complete the ethics self-assessment and attach the required documents.

[How to Complete your Ethics Self-Assessment](#)

## 5 - Call-specific questions

### Extended Open Research Data Pilot in Horizon 2020

If selected, applicants will by default participate in the [Pilot on Open Research Data in Horizon 2020<sup>1</sup>](#), which aims to improve and maximise access to and re-use of research data generated by actions.

However, participation in the Pilot is flexible in the sense that it does not mean that all research data needs to be open. After the action has started, participants will formulate a [Data Management Plan \(DMP\)](#), which should address the relevant aspects of making data FAIR – findable, accessible, interoperable and re-usable, including what data the project will generate, whether and how it will be made accessible for verification and re-use, and how it will be curated and preserved. Through this DMP projects can define certain datasets to remain closed according to the principle "as open as possible, as closed as necessary". A Data Management Plan does not have to be submitted at the proposal stage.

Furthermore, applicants also have the possibility to opt out of this Pilot completely at any stage (before or after the grant signature). In this case, applicants must indicate a reason for this choice (see options below).

Please note that participation in this Pilot does not constitute part of the evaluation process. Proposals will not be penalised for opting out.

We wish to opt out of the Pilot on Open Research Data in Horizon 2020.

Yes

No

Further guidance on open access and research data management is available on the Funding & Tenders portal: [http://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/open-access-dissemination\\_en.htm](http://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/open-access-dissemination_en.htm) and in general annex L of the Work Programme.

<sup>1</sup> According to article 43.2 of Regulation (EU) No 1290/2013 of the European Parliament and of the Council, of 11 December 2013, laying down the rules for participation and dissemination in "Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020)" and repealing Regulation (EC) No 1906/2006.

# **START PAGE**

MARIE SKŁODOWSKA-CURIE ACTIONS

**Innovative Training Networks (ITN)**

**Call: H2020-MSCA-ITN-2020**

PART B

REVOLUTION

**A new generation of REsearchers to reVOLutionise sustainable flood and drought risk soluTIONs**

**This proposal is to be evaluated as:**

**ETN**

## Table of Contents

List of Participating Organisations .....	3
Data for non-academic beneficiaries .....	4
Declarations .....	4
1 Excellence.....	5
1.1 Quality, innovative aspects and credibility of the research programme .....	5
1.2 Quality and innovative aspects of the training programme .....	10
1.3 Quality of the supervision.....	13
1.4 Quality of the proposed interaction between the participating organisations.....	15
2 Impact.....	16
2.1 Enhancing the career perspectives and employability of researchers and contribution to their skills development.....	16
2.2 Contribution to structuring doctoral / early-stage research training at the European level and to strengthening European innovation capacity, including the potential for: .....	17
2.3 Quality of the proposed measures to exploit and disseminate the results.....	18
2.4 Quality of the proposed measures to communicate the activities to different target audiences .....	19
2.5 Steps needed to bring about impacts, risk and mitigation strategy.....	20
3 Quality and Efficiency of the Implementation .....	21
3.1 Coherence and effectiveness of the work plan .....	21
3.2 Appropriateness of the management structures and procedures.....	28
3.3 Appropriateness of the infrastructure of the participating organisations.....	33
3.4 Competences, experience and complementarity of the participating organisations and their commitment to the programme.....	33
4 EID specific requirements .....	35
5 Participating Organisations.....	36
5.1 Beneficiaries .....	36
5.2 Partner organisations .....	46
6 Ethical Issues .....	52
6.1 European and national legal and ethics requirements.....	52
6.2 Specific ethics issues .....	52
7 Letters of Commitment.....	54

**List of Participating Organisations**

Consortium Member	Legal entity short name	Academic	Non-academic	Awards Doctoral Degree	Country	Dept. / division / laboratory	Scientist in charge	Role of partner organisation
<b><u>Beneficiaries</u></b>								
Stichting VU	VUA	✓		✓	The Netherlands	Institute for Environmental Studies	Philip Ward (M)	
Turun Yliopisto	UTU	✓		✓	Finland	Geography & Geology	Niina Käyhkö (F)	
Technische Universiteit Delft	DUT	✓		✓	The Netherlands	Water Management Department	Hessel Winsemius (M)	
FutureWater SL	FW		✓		Spain	Water, Food and Nature	Johannes Hunink (M)	
Stichting International Red Cross Red Crescent Centre on Climate Change and Disaster Preparedness	RC		✓		The Netherlands	Climate Science and Urban Teams	Erin Coughlan de Perez (F)	
Deutsches Zentrum fuer Luft- Und Raumfahrt EV	DLR	✓			Germany	Land Surface Dynamics Department	Mattia Marconcini (M)	
Albert-Ludwigs-Universität Freiburg	ALU-FR	✓		✓	Germany	Environment and Natural Resources	Kerstin Stahl (F)	
King's College London	KCL	✓		✓	United Kingdom	Geography	Faith Taylor (F)	
Ardhi University	ARU	✓		✓	Tanzania	School of Spatial Planning and Social Sciences	Ally Namangaya (M)	
Uppsala Universitet	UU	✓		✓	Sweden	Centre of Natural Hazards and Disaster Science	Giuliano di Baldassare (M)	

REVOLUTION – ETN

Partner Organisations								
FloodTags	FTags		✓		The Netherlands		Jurjen Wagemaker (M)	ESR co-supervision, training, secondments
Cloud to Street	C2S		✓		United States of America	Science	Beth Tellman (F)	ESR co-supervision, training, secondments
Uhurulabs	ULabs		✓		Tanzania		Frederick Mbuya (M)	ESR co-supervision, training, secondments
United Kingdom Research and Innovation	UKRI		✓		United Kingdom	British Geological Survey	John Bloomfield (M)	ESR co-supervision, training, secondments
Confederación Hidrográfica del Júcar	CHJ		✓		Spain		Teodoro Estrela (M)	ESR co-supervision, training, secondments
National Aeronautics and Space Administration	NASA	✓			United States of America	NASA Earth Science Division	Shanna McClain (F)	ESR co-supervision, training, secondments
JRC -Joint Research Centre- European Commission	JRC	✓			Belgium	Disaster Risk Management Unit	Paulo Barbosa (M)	ESR co-supervision, training, secondments
Humanitarian OpenStreetMap Team US, Inc	HOT-OSM	✓			United States of America		Tyler Radford (M)	ESR co-supervision, training, secondments
Stichting Deltares	DRES	✓			The Netherlands		Hanneke van der Klis (F)	ESR co-supervision, training, secondments
Barcelona Supercomputing Center - Centro Nacional de Supercomputacion	BSC-CNS	✓			Spain	Earth Sciences Department	Francisco J. Doblas-Reyes (M)	ESR co-supervision, training, secondments
United Nations International Strategy for Disaster Reduction	UNDRR		✓		Switzerland	Global Risk Analysis and Reporting Unit	Marc Gordon (M)	Training

**Data for non-academic beneficiaries**

Name	Location of research premises	Type of R&D activities	No. of fulltime employees	No. of employees in R&D	Website	Annual turnover (€)	Enterprise status	SME status
FW	Cartagena, Spain	Water resources decision support tools	3	3*	<a href="http://www.futurewater.es">www.futurewater.es</a>	259,000	Yes	Yes
RC	The Hague, Netherlands	Climate risk management and international policy	30	7	<a href="https://www.climatecentre.org/">https://www.climatecentre.org/</a>	3.8 million	No	No

\* FW also has 10 employees in R&D in its office in the Netherlands and in sister offices.

**Declarations**

Name (institution / individual)	Nature of inter-relationship
Prof. Hessel Winsemius	0.8 fte position at DUT and 0.2 fte position at DRES

# 1 Excellence

## 1.1 *Quality, innovative aspects and credibility of the research programme*

### 1.1.1 *Introduction, objectives and overview of the research programme*

Between 2008–2018, floods and droughts affected over a billion people, caused over 80,000 deaths, and half a trillion Euros in economic losses<sup>1</sup>. Hence, reducing flood and drought risk is at the core of international agreements like the Sendai Framework for Disaster Risk Reduction (SFDRR), Sustainable Development Goals (SDGs), and EU Water Framework & Flood Directives. There is no shortage of lofty goals, and the political will to reduce risk is clear.

**Decisions on reducing flood and drought risk in practice require the ability to effectively monitor and assess risk.** Only then can society understand its current level of risk, monitor whether risk is increasing or decreasing through time, and whether solutions designed to reduce that risk are actually effective. This is required now, as flood and drought risks are increasing around the world due to climate change and socioeconomic development.

This bestows a great responsibility on science: **society expects science to provide the know-how to design and assess solutions, and monitor progress in reducing risk. Yet, current scientific practice often falls short.** At the local scale, risk is traditionally monitored and assessed through expensive and time-consuming local studies, in which field measurement campaigns are carried out, and their results used to develop local risk monitoring platforms or models. The costs and time involved means that they are difficult to transfer to other geographical locations, and as a result they are limited to a few locations, and often not the most vulnerable ones. Hence, recent years have seen the development of global and EU-scale risk monitoring and assessment models. Whilst these can identify risk hotspots, their lack of detail at finer scale means they cannot be used for monitoring and assessing risk locally or regionally<sup>2</sup>.

Recently, there has been an explosion of **innovative ways of collecting data**, which could complement more established data sources. For example, **drone observatories** are used to fill the gap between sparse ground observations and coarse satellite data. Data from **social media** (e.g. Tweets) are used to trigger flood warnings, even before they are signalled by river gauges. **Communities can improve the mapping** of flood and drought-related variables through Volunteered Geographical Information Systems, e.g. OpenStreetMap, adding information to conventional mapping activities. The proliferation of data from **videos and photos** from platforms like Google Street View, social media, or Closed Circuit Television can be used to monitor and assess myriad variables. Some advantages of these datasets are that they are based on affordable and transferable technologies with wider global reach, and that many of them are also able to engage local actors much more strongly into the value chain of risk identification and reduction. Moreover, recently there has been an explosion of **new and innovative approaches for processing, analysing, and visualising these data**, such as **Cloud Computing, Machine Learning, Citizen Science, and Artificial Intelligence**, which allows for a smart-fusion of different data sources.

There are a growing number of examples of the use of such data and approaches. However, so far these are rather disparate. **A new network of networks is needed to synergise these emerging fields**, allowing flood and drought risk monitoring and assessment to shift towards the so-called Fourth Paradigm of science<sup>3</sup>, in which knowledge frontiers are pushed forward by new technologies for gathering, manipulating, analysing, and displaying diverse data, such as those described in the previous paragraph. Such a network should ensure that new science and knowledge is co-created with users (e.g. water-managers, companies, NGOs, local communities, general public). **To achieve this, a new generation of professionals and researchers is required to drive forward this new era of solution-driven science and emerging network of networks.** This is essential, given the “*alarming shortage of data experts both globally and in the European Union*” and lack of experts to bridge the chasm between innovative new data and approaches and scientific domain specialists<sup>4</sup>.

**Our overall aim is to REVOLUTIONise society’s ability to design and assess solutions to reduce flood and drought risk, through a high-level training, research, and networking programme in which we:**

1. **Co-develop novel data, tools and methods** for designing and assessing solutions, and monitoring and assessing progress in reducing flood and drought risk (*Science objective*);
2. **Train a new generation of professionals and researchers** with scientific, transdisciplinary and entrepreneurial skills to co-design disaster risk monitoring, assessment, and reduction solutions for society (*Training objective*);
3. **Diversify and secure career prospects of 15 Early Stage Researchers (ESRs)** through research-based and need-driven training, and actively mentoring ESRs’ searches for leading positions (*Career objective*);
4. **Bringing together an ambitious, transdisciplinary, and cross-sectoral network of networks**, at the cutting-edge of disaster risk science and practice, to ensure societal impacts and legacy (*Network objective*).

---

Publications of or with participation of consortium members are highlighted in bold.

<sup>1</sup> CRED, 2018. EM-DAT: The Emergency Events Database. Universite catholique de Louvain, Brussels

<sup>2</sup> Ward et al., 2015. Usefulness and limitations of global flood risk models. *Nat. Clim. Change*, 5, 712-715

<sup>3</sup> Hey et al., 2009. The Fourth Paradigm: Data-Intensive Scientific Discovery. Microsoft Research Publishing

<sup>4</sup> EC, 2016. Realising the European Open Science Cloud. EC, Brussels



To make REVOLUTION a success, we have a **unique consortium with all types of organisations in the so-called quadruple helix of social innovation, namely: academic, private sector, non-governmental and (intra)governmental**. From the academic sector, we include both universities and university-affiliated organisations (VUA, UTU, DUT, ALU-FR, KCL, ARU, UU, BSC-CNS), as well as non-university research institutions who perform non-academic activities in the private/policy domain (DLR, NASA, JRC, DRES, UKRI). We include private sector companies (FW, FTags, C2S, ULabs), non-governmental organisations (NGOs) (RC, HOT-OSM), and governmental agencies ranging from regional (CHJ) to intragovernmental (UNDRR). The involvement of RC and HOT-OSM guarantees excellent access to local communities, volunteers, and the public. Given our focus on innovative approaches and impact-based solutions, **our ESRs will be trained in the entrepreneurial skills needed in today’s rapidly changing labour market**, whether that be in an existing organisation or continuing their careers by initiating their own start-up business. Therefore, experience in entrepreneurship is included through FTags and C2S - 2 innovative companies that have won **several innovation prizes**.

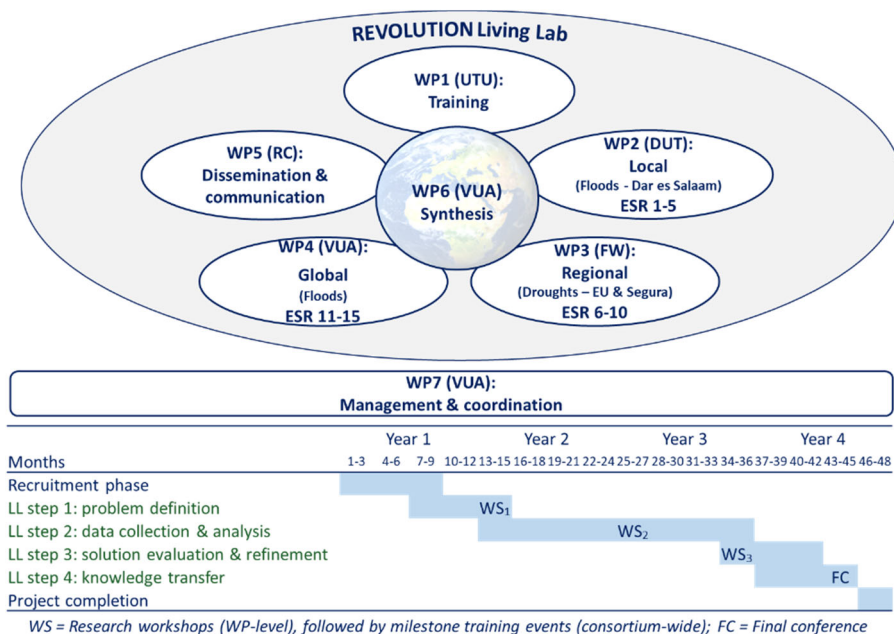
The project is implemented in 7 Work Packages (WPs) (Fig. 1.1a). Coordination of training takes place in WP1, which also ensures that ESRs achieve the REVOLUTION learning objectives stated in Section 1.2.1. The research is carried out by 15 ESRs in 3 scientific WPs (WP2-4; 5 ESRs per WP) that cover the geographical scales at which flood and drought risk challenges are faced in practice, namely local (Dar es Salaam, Tanzania), regional (Júcar river basin, Spain; EU), and global. WP5 covers dissemination, exploitation, and communication. WP6 synthesises the results from across REVOLUTION. Overall management and coordination take place in WP7.

**Box 1.1: Non-exhaustive examples of international targets relevant to water-related risks**

**SFDRR:** (a) Substantially reduce global disaster mortality by 2030; (b) Substantially reduce number of affected people globally by 2030; (c) Reduce direct disaster economic loss [...] by 2030. **SDGs:** (1.5) Reduce exposure and vulnerability to climate-related extreme events; (3.d) Strengthen the capacity of all countries [...] for early warning, risk reduction; (5.b) enhance the use of enabling technology; (6.4) substantially reduce the number of people suffering from water scarcity; (11.5) reduce the number of deaths [...] and substantially decrease the direct economic losses [...]water-related disasters; (13.3) Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

**1.1.2 Research methodology and approach**

**A main novelty of REVOLUTION is the use of a Living Lab (LL)<sup>5</sup> approach** (Fig. 1.1a). Training, research, dissemination, and communication are carried out through a co-creative innovation development process with stakeholders in a real-world setting. This is put into practice by phasing all activities through the following LL steps (Fig. 1.1a): (1) problem definition; (2) data collection and analysis; (3) solution evaluation and refinement; and (4) knowledge transfer. Each scientific WP (WP2-4) holds a series of *research workshops* (WS1-3 in Gantt Chart; Fig 1.1a) in which the first 3 steps of the LL-approach are carried out with stakeholders in the real-world settings that form the core of the scientific WPs. These workshops are held at WP level (i.e. each scientific WP carries out its own research workshops), and are *research-based*. Immediately following each round of research workshops, the entire consortium meets in 1 location for a network-wide *milestone training event* (Section 1.2.1), in which important scientific, transferable, and entrepreneurial skills required for the next step are learnt. A *final conference* (FC in Gantt Chart; Fig 1.1a) focuses on *knowledge transfer* (i.e. step 4), and will be combined with an *innovation event*, organised with the Impact Hub Amsterdam. To increase efficiency and reduce travel, milestone training



*Figure 1.1a: Overview of REVOLUTION project and Living Lab (LL) approach. Timing of 4 main LL steps, research workshops, milestone training events, and final conference shown in the simplified Gantt chart*

<sup>5</sup> Dell'Era, C. & Landoni, P., 2014. Living Lab. Creat. Innov. Manag., 23, 137-154

events and the final conference will be combined with general consortium meetings. An ETN is a natural fit to REVOLUTION’s aim and LL-approach, and the ESRs will actually work hands-on with stakeholders throughout the project. This creates an increased understanding of different perspectives between disciplines, cultures, types of organisations, and individuals. As a result of our LL-approach, REVOLUTION will strengthen society’s ability to establish more participatory, innovative, and impact-based solutions to reduce flood and drought risks.

The research is carried out in 3 real-world settings, covering the different geographical scales at which flood and drought risk challenges are faced in practice, namely local (WP2), regional (WP3), and global (WP4). Each scientific WP contains 5 ESR projects and addresses a distinct set of international agreements (Table 3.1a). By grouping ESRs into 3 WPs that address 3 real-world cases, instead of 15 disparate projects, we increase the interaction between ESRs and the critical mass required to interact with stakeholders. However, individual ESR projects are designed to avoid critical dependency. By designing REVOLUTION as a Living Lab (LL), with the same LL-steps across the different WPs, ESR projects, and training, we ensure a consistent programme. WP6 ensures that the novel data, tools, and methods are synthesised and integrated across the WPs, and contextualised in terms of their contribution to improving risk science and the development of DRR solutions. This is facilitated through a straightforward and effective set of tasks: (1) iteratively updating a working REVOLUTION synthesis document at each LL-step, by each ESR; (2) organising a REVOLUTION thematic special issue and conference session; and (3) producing a REVOLUTION high-level scientific synthesis and perspective paper, to be submitted to a high-impact journal such as *Nature Climate Change* (Milestone 9; Table 3.1c); several of the supervisors have extensive experience with this.

ESRs are employed for 36 months, starting in Month 9 (M9) (**NB: all month numbers are given from start of overall project, not start of ESR project**). M1-8 are dedicated to project start-up and recruitment. Following the kick-off meeting, each ESR initialises her/his research planning and becomes comfortable and embedded within their new living and working environment. After that, each ESR follows the 4 steps of the LL-approach; the first 3 steps are accompanied by 3 *research workshops* at WP level, and the fourth step is accompanied by the final conference. The first workshops (M14; Gantt chart Fig.1.1a) focus on *problem definition*. ESRs, beneficiaries, and partners work together with stakeholders from their WPs (e.g. government agencies, private companies, NGOs, representatives of the public) to refine the overall WP-level problem statement, ensuring that it is demand-driven and user-relevant. Each ESR is coupled to a stakeholder who will be involved throughout the project. The second workshops (M25) focus on *data collection and analysis*. Together with stakeholders from the first workshops (and stakeholders who have become interested through our dissemination and communication), ESRs present their initial data collection and analysis plans, ensuring that activities are aligned to stakeholder needs. In M36, the third workshops focus on *evaluation and refinement* of methods and tools. *Knowledge transfer* is the theme of our final network-wide conference and business innovation event (M45), attended by researchers, practitioners, and entrepreneurs from different disciplines, sectors, career stages, and cultural backgrounds. ESRs will be involved in organising these events, as part of their training. **Key information about each WP is listed in Table 1.1a. Summaries of scientific WPs 2-4 are given below, and specific aims, objectives, and tasks are described in Table 3.1a.**

*Table 1.1a: Work Package (WP) list*

Work package		Start Month	End Month	Activity Type	Lead Beneficiary		ESR involvement
No.	Title				No.	Short name	
1	Training	9	45	Training	2	UTU	ALL
2	Local	9	45	R&D	3	DUT	ESR1-ESR5
3	Regional	9	45	R&D	4	FW	ESR6-ESR10
4	Global	9	45	R&D	1	VUA	ESR11-ESR15
5	Dissemination and communication	1	48	Dissemination	5	RC	ALL
6	Synthesis	1	48	R&D	1	VUA	ALL
7	Management and coordination	1	48	Management	1	VUA	-

**WP2 (“Local”) aims to co-develop local scale observation and risk monitoring and assessment data, tools, and methods that are specifically tailored towards designing and assessing disaster preparedness and response at the local scale.** Flood risk is used to explore this aim. This requires local, up-to-date information on hazard, exposure, and vulnerability. In rapidly growing settlements, conventional methods to achieve this do not work well as they are often costly, difficult to sustain, and lack community buy-in. This places populations at high risk, especially the poor. Specific scientific challenges include: (1) generating accurate elevation data, which currently requires expensive surveys<sup>6</sup>; (2) constantly monitoring changes in conditions that exacerbate flood risk, yet avoiding invasive, expensive monitoring equipment with low spatiotemporal coverage<sup>7</sup>; and (3) making risk forecasts that can be used by humanitarian agencies to request emergency funds prior to a flood<sup>8</sup>. We address these challenges through 5 innovative ESR projects (ESR1-5), using Dar es Salaam (Tanzania) as case study. Dar es Salaam is a perfect fit to the scientific

<sup>6</sup> Murphy et al. 2017. Stream network modelling using lidar and photogrammetric digital elevation models. *Hydrol. Proc.* 22(12), 1747-1754

<sup>7</sup> Van de Giesen et al., 2014. *The Trans-African Hydro-Meteorological Observatory (TAHMO)*. Wiley Interdiscip. Rev. Water, 1(4)

<sup>8</sup> Coughlan de Perez et al., 2014. Science to prevent disasters. *Nat. Geoscience*, 7, 78-79

challenge, being a highly flood-prone city facing rapid population growth and unplanned development. It is also perfect from the perspective of the LL-approach, as it is an African hub for DRR innovation through: the Tanzania Urban Resilience Program (TURP); data collection through Ramani Huria, a community mapping effort led by the World Bank; and the initiation of the Resilience Academy, in which three consortium members (UTU, ARU, DUT) are represented. Our activities are embedded in these initiatives, ensuring buy-in, societal impact, and longevity. Through the Resilience Academy, a network exists for testing and transferring our new methods outside of Dar es Salaam. The ESRs will employ a wide range of novel data and methods (summary in Table 1.1b, details in Table 3.1d) to enable communities to map elevation in their own neighbourhood (ESR1), dynamically map and monitor risk due to changes in drainage infrastructure, solid waste, and urbanisation (ESR2&3); mapping conditions of dynamic, local, social vulnerability (ESR4); and providing real-time flood risk forecasts (ESR5).

**WP3 (“Regional”) aims to co-develop risk monitoring and assessment data, tools, and methods that are specifically tailored towards monitoring and forecasting risk at the European and river basin scales.** Drought risk is used to explore this aim. This requires information that allows us to move from a reactive society, to a society pro-actively managing drought risk. To facilitate this, drought monitoring and forecasting systems have been developed at different scales. However, these face several scientific challenges, including: (1) they lack information on groundwater resources<sup>9</sup>; (2) they focus on physical drought severity, and lack information on socioeconomic risk<sup>10</sup>; (3) their use in drought risk forecasting is limited due to lack of skill and co-creation with users<sup>11</sup>; and (4) there is a lack of understanding of how the behaviour of society can influence drought risk<sup>12</sup>. We address these challenges through 5 innovative ESR projects (ESR6-10), using the Júcar river basin (Spain) and Pan-European scale as case studies. The Júcar and EU are perfect fits to the scientific challenge, with the Júcar being one of the most drought-prone regions of Europe, and droughts becoming an increasing threat across the EU. They are also perfect from the perspective of the LL-approach: the Júcar is updating its Drought Management Plans and the EU is strengthening its European Drought Observatory (EDO). We embed our LL-approach in these activities by involving partners CHJ (Júcar River Basin Authority) and JRC respectively. Transferability is assessed by examining their use both at the scale of the Júcar and EU. The ESRs will employ a wide range of novel data and methods (summary in Table 1.1b, details in Table 3.1d) to: incorporate groundwater in European groundwater monitoring for the first time (ESR6), assess how human behaviour influences groundwater (ESR7), develop tools for monitoring and early warning of socioeconomic drought risk (ESR8&9), and develop user-oriented seasonal forecasts of drought risk (ESR10).

**WP4 (“Global”) aims to co-develop data, tools, and methods to enrich global risk monitoring and assessment by utilising datasets that are rich in local information and can be applied globally.** Flood risk is used to explore this aim. These data are essential for monitoring progress towards global targets of the SFDRR and other international agreements, and for assessing the large-scale effectiveness of DRR strategies such as infrastructural protection, nature-based solutions, spatial zoning, and retreat<sup>2</sup>. However, current global flood risk models face several scientific challenges including: large disagreement in modelled flood extent and depth between different models<sup>13</sup>; non-inclusion of human-made flood protection structures (e.g. dikes)<sup>14</sup>; and overly-simplified representation of exposure and vulnerability<sup>15</sup>. We address these challenges through 5 innovative ESR projects (ESR11-15). The work will be embedded within the UNDRR Global Risk Assessment Framework (GRAF), a framework for supporting decision-makers to achieve the SFDRR targets. GRAF is a perfect fit to the scientific challenge, as it aims to increase global understanding of complex risk and provide decision-makers with actionable insights and access to new data, tools, and methods. It is also perfect from the perspective of the LL-approach: GRAF is actively fostering a culture of inclusive, collaborative, and proactive co-development, to which the ESRs will directly contribute. Involvement in GRAF will also increase the likelihood of uptake of the REVOLUTION knowledge internationally. The ESRs will employ a wide range of novel data and methods (summary in Table 1.1b, details in Table 3.1d) to: improve the mapping of flood hazard extents and depths (ESR11&12); automatically detect and map dikes and levees (ESR13); and develop methods to better map exposure and vulnerability, including individual buildings (ESR14&15).

**The LL-approach is designed to ensure that ESRs work together in a complementary way to address the real-world problems central to WPs2-4, yet the individual ESR projects are designed to avoid critical dependency.** This is ensured by working towards the common objectives of the individual WPs, yet ensuring that each ESR co-develops her/his own data, tools, and methods without being dependent on input from other ESRs. Still, there is thematic overlap on many of the data, tools, and methods (see examples in Table 1.1b) and the ESRs work together in common scientific themes to lead to the major innovative contributions shown in Table 1.1c.

<sup>9</sup> Van Lanen et al., 2016. Hydrology needed to manage droughts: the 2015 European case. *Hydrol. Process.*, 30(17), 3097-3104

<sup>10</sup> Veldkamp, T.I.E. et al., 2016. Towards a global water scarcity risk assessment framework. *Environ. Res. Lett.*, 11, 024006

<sup>11</sup> Veldkamp et al., 2015. Sensitivity of water scarcity events to ENSO-driven climate variability. *HESS*, 19, 4081-4098

<sup>12</sup> Van Loon et al., 2016. Drought in the Anthropocene. *Nat. Geosci.*, 9, 89-91

<sup>13</sup> Trigg, M.A. et al., 2016. The credibility challenge for global fluvial flood risk analysis. *Environ. Res. Lett.*, 11, 094014

<sup>14</sup> Ward et al., 2017. A global framework for future costs and benefits of river-flood protection. *Nat. Clim. Change*, 7, 642-646

<sup>15</sup> De Moel et al., 2015. Flood risk assessments at different spatial scales. *Mitig. Adapt. Strat. Gl.*, 20, 865-890

Table 1.1b: Overview of ESR projects, and (non-exhaustive) examples of novel data, tools, and methods

ESR	ESR project title	Examples of novel data, tools, and methods
1	Community-based elevation and drainage data for neighbourhood scale flood modelling	Drones, smartphones & low-cost sensors
2	Citizen science to understand dynamic changes of local conditions on flood risk	Community mapping, VGI data
3	Mapping flow and solid waste from camera & video data using computer vision	Cameras & videos, computer vision techniques
4	Participatory mapping of multidimensional values of vulnerability in local communities	Participatory community mapping
5	Real-time flood risk impact forecasting for forecast-based humanitarian action	Community mapping, impact forecasting
6	Incorporating groundwater in drought risk assessment	Adaptive data assimilation; satellite data
7	Socio-hydrological modelling of groundwater use to improve drought risk management	Sociohydrological model, satellite and citizen data
8	Assessing socio-economic drought risk through novel impact functions	Machine learning, fusing satellite/qualitative data
9	Social media for early warning of drought events	Social media data (e.g. Twitter), online media
10	Improving risk-based seasonal drought forecasts	Machine learning, impact forecasting
11	Comprehensive global flood mapping	Machine learning, social media data, satellite data
12	Flood depth estimation from fusion of DEM and radar imagery	Machine learning, fusion of satellite/radar data
13	Detecting human-made flood protection structures through machine learning	Machine learning, fusion of multiple sensors
14	Improved exposure characterisation of buildings using machine learning	Machine learning, drone & 360° camera imagery
15	Integrated flood vulnerability mapping with local spatial knowledge, earth observation data and deep learning algorithms	Multi-resolution imagery, participatory mapping

### 1.1.3 Originality and innovative aspects of the research programme

Our LL-approach ensures that research, training, career development, dissemination, and communication are intricately linked and result in innovative transdisciplinary science and applied solutions, which are not achieved in traditional PhD training programmes. **In doing so, we increase society’s ability to achieve the targets of (international) agreements on disaster risk reduction (DRR) and sustainability.** Each ESR develops novel data, tools, and methods for designing and assessing solutions to reduce flood and drought risk, which means that **all ESR projects lead to innovative contributions beyond state of the art (see Table 1.1c).**

Several overarching innovative elements are:

- REVOLUTION advances flood and drought risk monitoring and assessment towards the **Fourth Paradigm of science**, by pushing knowledge frontiers using new technologies and approaches;
- REVOLUTION takes the **ground-breaking step of integrating the scientific risk framework**<sup>16</sup> with two recent scientific developments: (1) the use of **large, new, datasets that were not intended to be used in hydrology**<sup>17</sup> but might have useful applications, such as data from online media, citizen science, and satellites; and (2) **socio-hydrology**<sup>18</sup>, which studies interactions between hydrology and society;
- REVOLUTION **bridges the gap between local and global risk studies by using innovative locally collected data to complement and enrich more established data sources.** In doing so, we make the best of both worlds, progressing beyond state of the art in which most local studies use site-specific data that are expensive and time-consuming to collect, and global studies use coarse global datasets;
- REVOLUTION **ensures that new data, methods, and tools are embedded in user needs.** We progress beyond training state of the art through a LL-approach in which participatory and impact-based research are central.

Table 1.1c: Major innovative contributions beyond state of the art, incl. (non-exhaustive) examples of ESR projects

Current gaps in science and practice	REVOLUTION progress beyond state of the art
Capacity and methods to validate flood and drought risk models lacking in many regions	REVOLUTION carries out more detailed validation of local to global risk models by complementing established data with novel datasets and approaches (ESR1,5,6,8,11,12)
Local risk traditionally monitored and assessed through expensive and time-consuming studies	REVOLUTION develops, tests, and applies new methods to monitor and assess risk using low-cost sensors and remotely-sensed data (ESR1,3,6,8,12,13)
Lack of understanding at local to global scale on flood and drought impacts and responses	REVOLUTION leads to improved awareness for disaster managers, by co-creating feedback between citizens and decision-makers, e.g. through online media platforms (ESR5,9)
Real-time observation data on hazard, exposure, and vulnerability are not available or difficult to sustain at required level of detail	REVOLUTION increases ability of researchers and DRR practitioners to dynamically monitor hazard, exposure, and vulnerability through development and integration of novel observation methods (ESR3,4,6,9,13,14,15)
Limited use of citizen science in developing flood and drought risk solutions	REVOLUTION leverages citizen science data collection initiatives to improve risk monitoring and assessment at all spatial scales (ESR2,4,5,7,9,11,15)
Interactions and feedbacks between risk drivers and coping strategies difficult to disentangle	REVOLUTION develops models to explicitly examine the influence of human decision and behaviour on (interactions and feedbacks between) risk drivers (ESR2,7)
Implementation of early warning impact systems impeded by lack of co-design and forecast skill	REVOLUTION centralises the user perspective in co-design of impact early warning, and uses new methods to increase skill, leading to actionable warning information (ESR5,10)

### 1.1.4 Consideration of gender and inclusiveness

Disasters differentially impact women and marginal groups for numerous reasons, such as level of education, caregiving responsibilities, and domestic violence. Thus, gender aspects will be considered throughout REVOLUTION research in terms of types and methods of data collection and design of solutions. Consideration of gender aspects in disasters will be delivered through a training course during the kick-off meeting (Table 1.2b).

<sup>16</sup> UNDRR, 2015. *Global Assessment report 2015*. UNDRR, Geneva

<sup>17</sup> Borgman, 2015. *Big data, little data, no data*. MIT, Cambridge MA

<sup>18</sup> Sivapalan et al., 2012. *Socio-hydrology: A new science of people and water*. *Hydrol. Process.*, 26, 1270-1276

## 1.2 Quality and innovative aspects of the training programme

### 1.2.1 Overview and content structure of the training

REVOLUTION will train a **new generation of professionals with scientific, transdisciplinary and entrepreneurial skills to co-design disaster risk monitoring, assessment, and reduction solutions for society**. Therefore, the overall learning objective is that ESRs are competent professionals with science-based excellence in risk monitoring and assessment, and professional expertise and confidence to transfer that knowledge for society's benefit. After REVOLUTION, the ESRs can:

- Map and monitor flood and drought risks with established and novel (digital) data, tools and methods;
- Analyse and judge the quality of novel data, tools, and methods for improved risk assessment;
- Co-design innovative risk reduction solutions with REVOLUTION partners and relevant stakeholders;
- Transfer their professional skills and knowledge across problem domains for wider scientific impact.

**A major training and career development novelty of REVOLUTION lies in approaching flood and drought challenges and solutions through the LL-approach.** This means that research *and* training activities are intrinsically linked, and carried out in a participatory way with problem and solution owners in the real-world settings of WP2-4. This ensures alignment between the science, training, career, network, and learning objectives and activities, following Bloom's revised taxonomy<sup>19</sup> of educational objectives and the educational theory of constructive alignment<sup>20</sup>. The 15 ESRs work on **15 novel research topics** based on need-driven challenges. **Our training approach will enable ESRs to successfully grow into a new generation of professionals, with diverse career paths and employment possibilities** (see Section 2.1). **The ESRs are at the heart of the LL-approach**, and follow a **programme consisting of 6 main training modalities** (Fig. 1.2a). They are supported by a unique consortium of academic, private, NGOs, and (intra-)governmental organisations, as shown in Fig 1.2a and described in Sections 1.4 & 3.4. Each ESR will also be affiliated to a **local innovation hub for learning co-design in practice**. Each ESR is supported by an ESR Supervisory Team (Section 1.3). **The content and modalities of the training programme are designed and structured around a set of career perspectives** (Table 2.1a) that we co-developed with potential employers. The 6 training modalities are described in the following paragraphs, and address the seven principles of doctoral training as set out by the European Commission.

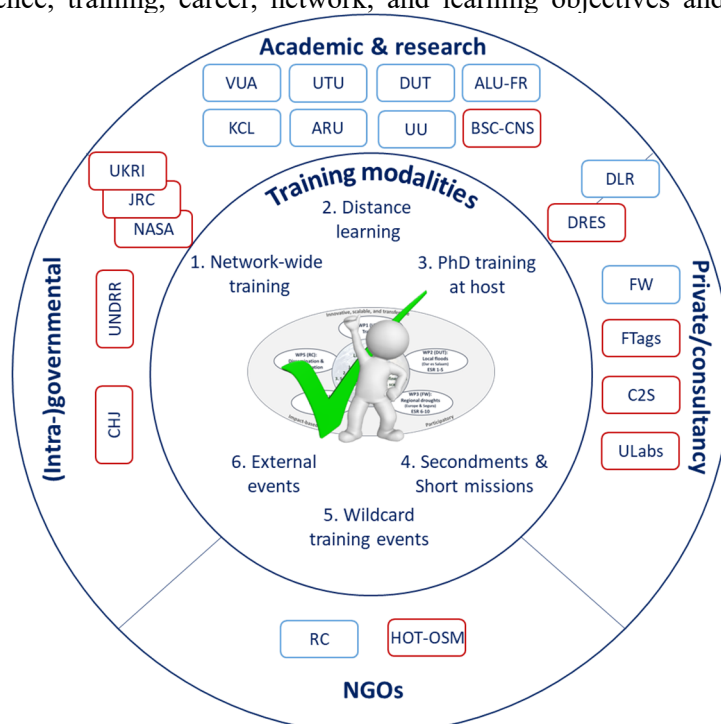


Figure 1.2a: Overview of REVOLUTION LL-approach for an ESR. Blue boxes = beneficiaries, red boxes = partners

Table 1.2a: Recruitment deliverables per beneficiary. *Italics shows organisation working in non-academic arena*

Researcher No.	Recruiting participant (short name)	PhD awarding entities	Planned start month 0-45	Duration (months) 3-36	Secondment at participants (short names)
ESR1	DUT	DUT	9	36	ARU, <i>HOT-OSM</i>
ESR2	KCL	KCL	9	36	ARU, <i>DRES</i>
ESR3	ARU	ARU	9	36	<i>ULabs</i> , UTU
ESR4	UTU	UTU	9	36	ARU, <i>RC</i>
ESR5	<i>RC</i>	DUT	9	36	DUT, JRC
ESR6	ALU-FR	ALU-FR	9	36	JRC, <i>UKRI</i>
ESR7	UU	UU	9	36	<i>CHJ</i> , VUA
ESR8	<i>FW</i>	ALU-FR	9	36	ALU-FR, JRC
ESR9	VUA	VUA	9	36	<i>FTags</i> , <i>FW</i>
ESR10	<i>FW</i>	VUA	9	36	VUA, BSC-CNS
ESR11	VUA	VUA	9	36	<i>FTags</i> , <i>C2S</i>
ESR12	<i>DLR</i>	UTU	9	36	UTU, DUT
ESR13	DUT	DUT	9	36	<i>DLR</i> , <i>DRES</i>
ESR14	<i>DLR</i>	VUA	9	36	<i>NASA</i> , VUA
ESR15	UTU	UTU	9	36	<i>NASA</i> , KCL

<sup>19</sup> Krathwohl, 2002. A Revision of Bloom's Taxonomy: An Overview. Theory Into Practice, 41, 212-218

<sup>20</sup> Biggs, J., 1996. Enhancing teaching through constructive alignment. Higher Education, 32347-32364

**(1) Network-wide training:** We will gather 6 times for network-wide training events (Table 1.2b). This includes a start-up meeting (M2) before the ESRs have been recruited, which includes a **training of the trainers** element. Consequently, there are 5 network-wide training events that will be attended by all ESRs; each event focuses on scientific, transferable, and entrepreneurial skills. The different events are summarised in the following paragraphs. **The core of our network-wide training programme are 3 Milestone Training Events - see below for details.**

*Table 1.2b: Main network-wide training events, conferences and contribution of beneficiaries*

	Main training events & conferences	ECTS	Lead institution	Action month (estimated)
1	<b>Start-up meeting (Theme: recruitment and programme planning)</b> (2 days) – Amsterdam, Netherlands 1.1 <b>Training of the trainers: Implementing a LL in practice (UTU); sharing good practice on effective PhD supervision (VUA)</b>		VUA	2
2	<b>Kick-off meeting (Theme: Problem definition)</b> (1 week) 2.1. <b>Scientific skills:</b> Risk concepts & global DRR solutions (UNDRR); state of art risk assessment methods (VUA); gender aspects in disaster risk (KCL); research integrity (KCL); case study design (UU) 2.2. <b>Transferable &amp; entrepreneurial skills:</b> PhD planning and time management (DUT); co-design workshops and using participatory approaches (UTU); media training for scientists & ethical and legal aspects of communication (external); serious games in DRR (RC); teamwork & creativity (FTags/C2S)	1.5	VUA	9
3	<b>Milestone training event 1 (Theme: Data collection)</b> (2 weeks) – Dar es Salaam, Tanzania 3.1 <b>Scientific skills:</b> Innovative data collection methods, incl. low-cost sensors & integration with established methods (DUT), radar remote sensing (DLR), satellite data (NASA); community-based mapping (HOT-OSM & UTU), citizen science (KCL), social research (UU), UAV and photogrammetry with open-source tools (ULabs), data-mining and machine-learning (C2S), hydrological data collection and quality checking (UKRI); designing and presenting scientific posters & making the most of conferences (ALU-FR) 3.2 <b>Transferable &amp; entrepreneurial skills:</b> Entrepreneurial and innovation development skills (FTags); working with volunteers and local communities (ARU & RC); effective data management (FW); scientific paper writing and presentation skills (VUA); responsible research and innovation (FW)	4	DUT/ARU	14
4	<b>Milestone training event 2 (Theme: Data analysis)</b> (2 weeks) – Ispra, Italy 4.1 <b>Scientific skills:</b> Innovative data analysis methods, incl. machine learning techniques (DUT & VUA), High Performance Computing data analysis (BSC-CNS); Google Earth Engine (C2S); video and image processing (DUT & ULabs); Copernicus Emergency Management Service (JRC) 4.2 <b>Transferable &amp; entrepreneurial skills:</b> IPR (FW); business development skills (FW, FTags, C2S); writing compelling proposals (DRES) (incl. workshop on European Researchers’ Night proposal); applied improvisation (RC); balancing time on research and applications (FTags)	4	VUA/JRC	25
5	<b>Milestone training event 3 (Theme: Solution evaluation and refinement)</b> (2 weeks) – Valencia, Spain 5.1 <b>Scientific skills:</b> Critical reflection & review (incl. hands-on workshop on writing a scientific peer-review) (ALU-FR); climate and hydrological service provision (UKRI); risk management decision-making in practice - field-trip in the Júcar river basin (CHJ) 5.2 <b>Transferable &amp; entrepreneurial skills:</b> Starting up (at a start-up & business development (C2S & FTags); communication for outreach and networking (UTU); organising scientific and professional events (external); knowledge transfer and international agreements (UNDRR)	4	FW/CHJ	36
6	<b>Final conference &amp; business innovation event (Theme: Knowledge transfer)</b> (2 days + 1 day meeting) – Amsterdam, Netherlands	1	VUA	45

**Start-up meeting:** Takes place prior to ESR recruitment. Day 1 focuses on developing a shared understanding of how to implement the LL-approach in practice, and includes a ‘train the trainer’ event to share good practices in effective supervision of PhDs between (co)-supervisors, and ensure consortium-wide standards. The other day focuses on management and recruitment.

**Kick-off meeting:** We bring together all recruited ESRs and (co)-supervisors. Day 1 focuses on getting to know each other, involving interactive, fun, yet educational serious games. Day 2 introduces ESRs to the LL-approach and state of the art knowledge on risk and risk management. Day 3 involves a field trip to explore risk management in The Netherlands in practice. Days 4 & 5 involve training of the remaining scientific, transferable, and entrepreneurial skills listed under event 2.1 & 2.2 (Table 1.2b).

**Milestone training events:** These are the core of our network-wide training programme. A total of 3 Milestone Training Events will be held, each with a duration of 2 weeks. They are physically held in the real-world settings of WP2-4, i.e. Dar es Salaam, the Júcar river basin, and Ispra (the latter as focal point of global risk activities of JRC). Each Milestone Training Event has a focus theme (Table 1.2b), aligned to one of our LL-steps. **The ESRs will be presented with a real-world transdisciplinary problem faced by stakeholders in the location of the milestone training event, and will be required to co-design and propose solutions to this problem during the 2 weeks.** This is facilitated by dividing time between traditional and modern pedagogical methods including lectures, discussions, practicals, serious games, and technology-enhanced learning (half of the time), and group work in the field with stakeholders (half of the time). **The choice of physically hosting these events within our real-world case studies (i.e. Dar es Salaam, Júcar river basin, Ispra) is absolutely fundamental to the concept of our LL-approach,** as it allows the ESRs to practice and implement their skills in the cases in which we are actually working to design solutions, mentored by trusted supervisors and institutes from all beneficiaries and partners. The motivation for the choice of these real-world settings from a scientific and LL-perspective are described in Section 1.1.2. By holding a Milestone Training Event in Dar es Salaam, all ESRs will gain experience in working in the context of the Global South, thereby expanding working skill and enhancing career opportunities. The themes and a brief synopsis of content can be found in Table 1.2b. Note that we have not rigidly fixed the daily programme, since a participatory co-design process with stakeholders requires flexibility in planning within the content of a clearly defined framework. **Wherever possible, we couple transferable skills training to ongoing ESR activities.** For example: in event 3.2, training on paper writing is carried out through papers that the ESRs are actually working on; and in event 4.2, training on writing compelling proposals is facilitated by mentoring the ESRs to write a proposal for funding to organise a European Researchers’ Night. This means that the training, research, and career development activities

are synergetic, ensuring an efficient use of time and resources. We have deliberately limited the number of network-wide events, and focused on longer events, for several reasons: (1) it allows us to implement the LL-approach through hands-on problem solving; (2) informal discussions with fellows of past and ongoing Marie Skłodowska-Curie ITN (and other) training programmes reveal a richer learning experience from longer events and disruption to workflow from many shorter events; and (3) it allows us to save on costs, travel, and environmental damage. **For the latter reason, we will hold consortium meetings in conjunction with milestone training events.**

**Final conference and business innovation event:** We will organise a 1-day final conference followed by a 1-day innovation event. In the *conference*, we present our results to a broad stakeholder network (scientists and practitioners from companies, NGOs, governmental organisations), with a focus on research impacts and ESRs' careers. The conference format allows for maximum interaction between ESRs and attendees. Whilst we will have keynote and ESR presentations, this will be done using innovative methods, e.g. ignite talks, map-slams, live experiments, games, debates, and focus groups. The *business innovation event* will be designed by the ESRs with experienced staff of *Impact Hub Amsterdam*. Teams of innovation-oriented researchers, practitioners, and entrepreneurs will take up innovation challenges around the ESRs' research and continue refining it towards business solutions.

**(2) Distance learning:** We will provide distance learning opportunities, mainly for scientific skills required by groups of ESRs or individual ESRs. Where available, we will use existing materials, such as the extensive online training resources of NASA for analysing satellite data. A catalogue of relevant materials will be developed in M1-8 and made available to the ESRs at the kick-off meeting. We will also develop new distance learning resources (e.g. mini-MOOCs) on specific topics relevant to clusters of ESRs (e.g. machine learning, community participation and community mapping, fusion of global and local data), and make these available via the project website. Each ESR will include a plan of the distance learning courses to be followed as part of her/his Personal Career Development Plan. Our new distance learning resources will be made available via our website and channels such as YouTube, thereby contributing to research training at European level. To maximise impact, ESRs will publish online training materials of their projects (e.g. knowledge clips, web lectures; Sections 2.3 & 2.4).

**(3) PhD training at host and degree-granting institutions:** All host beneficiaries organise in-house courses that can be followed by the ESRs. Moreover, as ESRs are enrolled in PhD programmes (Table 1.2a), they can follow the wide range of PhD courses offered by their graduate schools.

**(4) Secondments and short missions:** Each ESR will carry out secondments at 2 other beneficiaries or partners (total: 7-10 months). **To stimulate cross-sectoral and transdisciplinary learning and knowledge exchange, all ESRs hosted at an academic beneficiary will carry out at least one secondment at a beneficiary/partner organisation working in the non-academic arena, and vice versa.** Secondments enable the professional development of methodological skills, but also strengthen competences in working in diverse and transdisciplinary environments and teams. Secondments at universities ensure growth of scientific skills, and secondments at non-universities play a key role in linking ESRs to impact-based research and problem owners. Secondments have been planned to maximise the time that ESRs spend visiting each other, thereby facilitating peer-to-peer learning. Next to secondments, short missions will be encouraged, depending on emerging synergies and requirements.

**(5) Wildcard training events at ESR cluster level:** In any co-creative process, (stakeholder) needs change over time, and hence our training programme must be flexible enough to respond to any changes in educational needs. Therefore, we leave room for new *wildcard training events*, which would be offered to clusters of ESRs requiring similar (scientific, transferable, or entrepreneurial) emerging skills, after prior approval by the Supervisory Board. In doing so, we endorse the debate on the *flexibility agenda* currently taking place within Higher Education<sup>21</sup>, in which there is growing recognition that training flexible graduates who can engage with the uncertainties, complexities, and demands of a rapidly changing world, requires flexibility in higher education programmes.

**(6) External events:** ESRs will actively participate in external academic and professional events (e.g. conferences, workshops, seminars, innovation challenges, summer schools), and present in at least 1 scientific conference per year. At these events, ESRs practice presentation and networking skills, and learn the most recent developments in science and practice. Examples of relevant events are: Understanding Risk, Adaptation Futures, European Geosciences Union (EGU), FOSS4G, and Google Earth Engine Summits. As several ESRs and supervisors will attend these events, we will arrange side meetings between those in attendance to discuss progress. ESRs will actively take part in innovation hackathons and mapathons organised by the EU Copernicus programme and local Innovation Hubs.

### 1.2.2 Role of non-academic sector in the training programme

Non-academic beneficiaries and partners, and those who mainly perform non-academic activities in the private/policy domain, are integral to the LL-approach, since they keep the ESRs close to real-world solution needs. They are involved in the training, by: (a) leading 2 WPs; (b) hosting and supervising 5 ESRs; (c) co-supervising 13 ESRs; (d) organising and co-hosting milestone training events and research workshops; (e) providing lectures and courses; and

<sup>21</sup> UK Higher Education Authority, 2014. Conditions of flexibility. Securing a more responsive higher education system. HEA, York

(f) providing distance learning materials. Commitments of beneficiaries and partners in hosting ESRs and secondments are summarised in Table 1.2a and detailed in Table 3.1d. Table 1.2c summarises their minimum commitments to network-wide training activities.

As the officially mandated UN organisation for coordinating DRR, the involvement of **UNDRR** provides ESRs with access to the DRR decision-making process and political agenda at the highest level. **JRC** provides direct input to research and policy of the European Commission, including the European Drought Observatory, to which our ESRs will add innovative new knowledge. **CHJ**, as the governing authority of the Júcar river basin, provide hands-on expertise and training on water management and project implementation. The involvement of 3 innovation-prize winning small companies that are revolutionising disaster risk monitoring technologies (**FTags**, **C2S**, **ULabs**) ensures that ESRs acquire entrepreneurial skills; their founders will act as role models to the ESRs. Co-design and entrepreneurial skills are also fostered in practice by affiliating each ESR to local innovation hubs. The SME **FW** brings a wealth of experience for training ESRs in fusing practical DRR solutions with scientific knowledge. FW has successfully coordinated WPs in several collaborative EU projects, playing an instrumental role as WP lead in the H2020 IMPREX and BRIGAD projects. **DRES** is a world-leading knowledge water management institute, providing consultancy services on smart solutions and innovations to governments and businesses. Their participation offers ESRs access to an extensive suite of state-of-the-art modelling software. The involvement of **NASA** and **DLR** provides ESRs with access to the cutting-edge expertise in remote sensing and satellite data of these aeronautics and space agencies. Whilst DLR offers unparalleled expertise on using remote sensed data to map exposure and vulnerability, NASA provides access to its innovative Disaster Applications Program, in which advanced training is developed on using satellite data in disaster risk applications. The involvement of 2 NGOs, **RC** and **HOT-OSM** gives the ESRs unique access to local communities and expertise in on-the-ground humanitarian action. Through its global network, RC can provide access to local Red Cross institutions around the world – and their huge network of local volunteers - including Tanzania and Spain. HOT-OSM leads large scale community mapping initiatives in several cities, including Dar es Salaam, providing access to mapping volunteers. The **British Geological Survey** (the component body of **UKRI** involved in REVOLUTION) provides ESRs with a wealth of hydrological data, and experience on the interaction between science and the public.

*Table 1.2c: Commitments of non-academic institutes to network-wide training. NB: Table contains institutes classed as non-academic in ECAS; many others also mainly carry out non-academic activities*

Institute	Sector	Commitments to network-wide training activities (shown in Table 1.2b)
FW	Consultancy (SME)	Effective data management, including data repositories and Copernicus data store (3.2); IPR, including open-source licensing of code and software, versus proprietary licensing (4.2)
RC	Non-governmental org.	Applied improvisation course (4.2); serious games in DRR (2.2)
FTags	Consultancy (SME)	Teamwork & creativity (2.2); entrepreneurial and innovation development skills (5.2); starting (at) a start-up (5.2); balancing time on research and applications (4.2)
C2S	Consultancy (SME)	Teamwork & creativity (2.2); starting (at) a start-up & business development (5.2); using Google Earth Engine in hydrological applications and remote sensing (4.1); data-mining and machine learning (3.1);
ULabs	Technology & innovation	UAV and photogrammetry with open-source tools (3.1); video and image processing (4.1)
UKRI	Cross-sectoral partnership	Hydrological data collection and quality checking (3.1); provision of hydrological data services (5.1)
CHJ	Governmental org.	Risk management decision-making in practice - field-trip in the Júcar river basin (5.1)
UNDRR	Intergovernmental org.	Risk concepts & global DRR solutions (2.1); knowledge transfer in international agreements (5.2)

### 1.3 Quality of the supervision

Top-quality supervision is paramount to REVOLUTION’s success. Supervision arrangements and monitoring are ensured through **tailored Personal Career Development Plans (PCDPs)**. These contain a supervision and training plan, PhD outline (problem statement, aims, methods, expected results, milestones, dissemination and exploitation plan). They are written by each ESR, together with her/his **ESR Supervisory Team** (Section 1.3.2) and submitted for internal review (to the Supervisory Board) in M12. The PCDP is used as a tool for planning, monitoring, and evaluation. They use a standard template developed by the Executive Board, led by the Training Development Officer, to ensure the same high supervision standards across the consortium; but are tailored to the needs of each ESR. PCDPs form the basis of the Formal Evaluation Meetings, and will be reviewed and, if necessary, revised during these meetings. For more detail on ESR project monitoring and evaluation see Section 3.2.4.

#### 1.3.1 Qualifications and supervision experience of supervisors

ESRs benefit from the experience of the ESR Supervisory Teams in guiding young researchers in developing their careers. All beneficiaries have profound experience in supervising PhDs and young researchers, as well as executing research projects (Section 5). The supervisors at academic beneficiaries are all senior Principal Investigators (PI), have jointly supervised over 140 PhD students, and are established experts in their fields. The host supervisors at non-academic beneficiaries all supervise junior researchers and have previously been involved in (co-)supervision of PhD candidates. For example, RC hosts ESR4, whose PhD supervisor works at DUT – the organisations have many successful collaborations. ESRs hosted at non-university beneficiaries receive their PhD degree from one of the university beneficiaries (Table 1.2a). In these cases, one of the secondments will be carried out at this university, and



the official degree-granting (Associate) Professor is part of the Supervisory Team. A summary of the profiles of the main and PhD-granting supervisors can be found in Table 1.3a.

Table 1.3a: Overview of main and PhD-granting supervisor profiles

Main supervisor	ESR	Profile and background
Prof. Ward	11 <b>14*</b>	Expert in global to local flood & drought risk modelling. Full Prof. Global Water Risk Dynamics; Head of Global Water and Climate Risk section; Director of MSc Hydrology; visiting lecturer at Columbia Uni. Member of UNDRR Expert Group GRAF. EGU 2019 Plinius Medal. 90 peer-reviewed papers. H-index: 44. 16 PhD students (6 completed)
Prof. Stahl	6 <b>8*</b>	Expert in socio-economic drought impacts. Full Prof. Environmental Hydrological Systems. Chair of UNESCO FRIEND-Water Drought Group. 74 peer-reviewed papers. H-index: 40. 13 PhD students (7 completed)
Prof. Aerts	9	Expert in decision support. Full Prof. Water Risks; Director IVM-VUA; Member Spatial Infrastructure advisory committee. AGU 2019 Gilbert White Award. 166 peer-reviewed papers. H-index: 62. 35 PhD students (21 completed)
Prof. di Baldassarre	7	Expert in sociohydrology. Full Prof. Hydrology; Director CNDS (& international summer school). Recipient of ERC Consolidator Grant, EGU Early Career Award. >100 peer-reviewed papers. H-index: 38. 14 PhD students (8 completed)
Prof. Hut	1	Expert in low cost sensor development and infrastructure for global models. Assist. Prof. in sensor design. P.I. on eWaterCycle project. 21 peer-reviewed papers. H-index: 11. 3 PhD students. 11 MSc students supervised
Dr. Chadwick	2	Expert in human impacts to urban watercourses. Lecturer in Physical and Environmental Geography. 30 peer-reviewed papers. H-index: 12. 12 PhD students (6 completed)
Prof. ten Veldhuis	<b>5*</b>	Expert in hydrometeorology & urban flood risk. Assoc. Prof. Hydrometeorology. IWA Working Group Urban Rainfall. Lecturer at IHE Delft, organiser ERAD course. 32 peer-reviewed papers. H-index: 15. 5 PhD students (3 completed)
Prof. Namangaya	3	Expert in land use planning. Dean School of Spatial Planning. Member International Association of Spatial Planners. University coordinator Resilience Academy. 12 peer-reviewed papers. 4 PhD students. 12 MSc students supervised
Prof. Käyhkö	4 15	Expert participatory GIS. Assoc. Prof. Digital Geospatial Research. Coordinator Resilience Academy. 40 peer-reviewed papers. H-index: 12. 7 PhD students (4 completed) & >25 MSc students. Hosting more than 100 Tanzanian training visitors
Prof. Coumou	<b>10*</b>	Expert in climate change & extreme weather. Assoc. Prof. Member of US CLIVAR (part of the World Climate Research Program), visiting scientist at KNMI and PIK. 67 peer-reviewed papers. H-index: 27. 9 PhD students (4 completed)
Prof. Winsemius	13	Expert in local flood management. Assoc. Prof. Hydrology and Water Resources Management. PI in many training and research projects for Deltas. 55 peer-reviewed papers. H-index: 35. 7 PhD students (3 completed) & >20 MSc students
Prof. Alho	<b>12*</b>	Expert in fluvial geomorphology and remote sensing. Full Prof. Hydrogeography and Remote Sensing. Active supervising of international visiting Postdocs. 63 peer-reviewed papers, H-index: 26. 11 PhD students (9 completed)
Prof. van Aalst*	<b>5*</b>	Expert in climate risk. Full Prof. & Director at RC. Adjunct at Columbia Uni. & UCL. Coordinating IPCC Lead Author. 82 peer-reviewed papers. H-index: 30. 4 PhD students (1 completed) & coordination of early career researchers at RC
Dr. Contreras*	<b>8*</b>	Expert in remote sensing. Senior Ecohydrologist. Developer of Spanish Drought Portal InfoSequia. Trainer in expert workshops on remote sensing. 19 peer-reviewed papers & >30 reports. H-index: 16. 12 early career researchers/MSc students supervised
Dr. Hunink*	<b>10*</b>	Expert in water management. Managing Director FW. Expert trainer in hydrological modelling & GIS in 15 countries. 20 peer-reviewed papers & 14 reports. H-index: 13. 182 early career researchers/MSc students supervised
Dr. Marconcini*	<b>12*</b> <b>14*</b>	Expert in global urban monitoring. Senior researcher at DLR. President of European Chapter of International Society for Digital Earth. 52 peer-reviewed papers. H-index: 21. 3 PhD students (1 completed) & 15 MSc students

\* indicates that the main supervisor is not the PhD-granting supervisor. In these cases the co-supervisor shown in bold is the PhD-granting supervisor (and she/he works at a PhD-granting beneficiary)

### 1.3.2 Quality of the joint supervision arrangements

The overall **REVOLUTION supervision framework** is summarised in Fig. 1.3a. The ESR and her/his PCDP are central. Supervision is arranged within each ESR Supervisory Team, which consists of: **2 supervisors at the host beneficiary**; and **2 co-supervisors**, who are members of staff at the organisations where the ESR carries out her/his 2 secondments (Table 1.3b). The entire ESR Supervisory Team is involved throughout the project, to ensure that all involved in each ESR project work as a team towards a shared goal throughout the project, rather than viewing secondments as isolated parts of the ESRs' development. The ESRs will be fully integrated into the wider teams at their host and secondment organisations, thereby gaining a wide range of interdisciplinary skills.

One of the host beneficiary supervisors is the formal **main supervisor** - this is a senior PI, who has overall responsibility for monitoring and reporting progress to the Supervisory Board. **For ESRs hosted at universities, the main supervisor is also the PhD-granting (Associate) Professor.** In keeping with the supervision structures of our beneficiaries, each ESR is also appointed a second host supervisor. Together, the host supervisors provide daily supervision throughout REVOLUTION. The second supervisor at the host beneficiary can be a junior member of (tenured) staff, with extensive knowledge of the ESR's topic. This allows REVOLUTION to explicitly support the 'train the trainer' concept. Co-supervisors provide daily supervision during secondments. The ESR Supervisory Teams and their ESRs have bi-monthly telcons during the entire project. To ensure optimal quality of supervision, the Supervisory Board (Section 3.2.2) includes a Training Development Officer, Prof. Niina Käyhkö (UTU), who will ensure consistency in supervision across individual ESRs. The Training Development Officer will monitor supervision quality by conducting surveys among ESRs and ESR Supervisory Teams, and will provide (unsolicited) external advice to both. Members of the Supervisory Board will provide advice to all ESRs, based on their presentations during consortium meetings at the network-wide events.

REVOLUTION – ETN

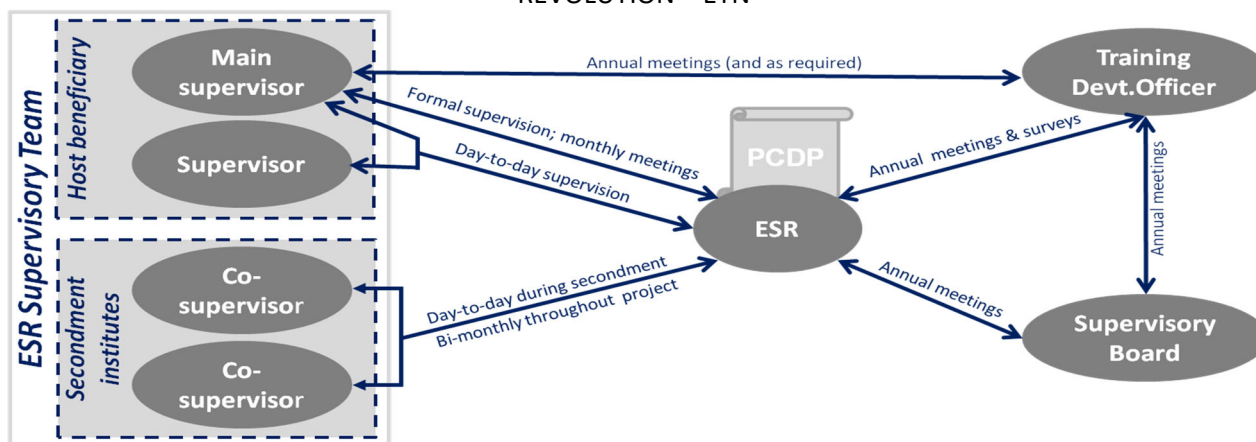


Figure 1.3a: Overview of supervision framework

Table 1.3b: Overview of supervisors and co-supervisors (F/M = Female/Male). **PhD-granting (Associate) Professors shown in bold**

ESR	Host beneficiary supervisors (main supervisor first)	Co-supervisors (from secondment organisations)
1	<b>Prof. Hut</b> (M) & Dr. Tiberius (M) (DUT)	Mr. Gayton (M) (HOT-OSM) & Prof. Liwa (M) (ARU)
2	<b>Dr. Chadwick</b> (M) & Dr. Taylor (F) (KCL)	Dr. Donchyts (M) (DRES) & Prof. Liwa (M) (ARU)
3	<b>Prof. Namangaya</b> (M) & Dr. Mayunga (M) (ARU)	Mr. Frederick Mbuya (M) (ULabs) & Prof. Alho (M) (UTU)
4	<b>Prof. N. Käyhkö</b> (F) & Dr. E. Kasvi (F) (UTU)	<b>Prof. Namangaya</b> (M) (ARU) & Dr. Coughlan de Perez (F) (RC)
5	Prof. van Aalst (M) & Dr. Coughlan de Perez (F) (RC)	<b>Prof. ten Veldhuis</b> (F) (DUT) & Dr. Salamon (M) (JRC)
6	<b>Prof. Stahl</b> (F) & Dr. de Graaf (F) (ALU-FR)	Dr. Bloomfield (M) (UKRI) & Dr. Barbosa (M) (JRC)
7	<b>Prof. di Baldassarre</b> (M) & Dr. Mazzoleni (M) (UU)	Prof. Anne van Loon (F) (VUA) & Mr. Teodoro Estrela (M) (CHJ)
8	Dr. Contreras (M) & Dr. Hunink (M) & (FW)	<b>Prof. Stahl</b> (F) (ALU-FR) & Dr. Barbosa (M) (JRC)
9	<b>Prof. Aerts</b> (M) & Prof. de Moel (M) (VUA)	Mr. Wagemaker (M) (FTags) & Dr. Hunink (M)
10	Dr. Hunink (M) & Dr. Contreras (M) (FW)	<b>Prof. Coumou</b> (M) (VUA) & Prof. Doblaz-Reyes (M) (BSC-CNS)
11	<b>Prof. Ward</b> (M) & Prof. de Moel (M) (VUA)	Dr. Tellman (F) (C2S) & Mr. Wagemaker (M) (FTags)
12	Dr. Marconcini (M) & Dr. Metz (F) (DLR)	<b>Prof. Alho</b> (M) (UTU) & Prof. Winsemius (M) (DUT)
13	<b>Prof. Winsemius</b> (M) & Prof. Morales Napoles (M) (DUT)	Dr. Donchyts (M) (DRES) & Dr. Marconcini (M) (DLR)
14	Dr. Marconcini (M) & Dr. Metz (F) (DLR)	<b>Prof. Ward</b> (M) (VUA) & Dr. Green (M) (NASA)
15	<b>Prof. Käyhkö</b> (F) & Dr. Gonzales Inca (M) (UTU)	Dr Taylor (F) (KCL) & Dr. McClain (F) (NASA)

#### 1.4 Quality of the proposed interaction between the participating organisations

##### 1.4.1 Contribution of all participating organisations to the research and training programme

REVOLUTION is composed of beneficiaries and partners with excellent track records in training young scientists. The consortium has vast experience in joint organisation of research workshops and projects, symposia, and training events. **All beneficiaries and partner organisations - including non-academic - will contribute to the REVOLUTION research and training programme through hands-on training during Milestone Training Events, lectures, courses, and online training materials** (Tables 1.2b, 1.2c). All beneficiaries host 1-2 ESRs, and our partners host at least 1 secondment (Table 1.2a). An exception is UNDRR, whose formal role is in the research workshops, training, and networking. This is a perfect fit to their role as international secretariat in the facilitation of disaster risk reduction. Each beneficiary is responsible for ensuring the full involvement of the ESRs in all network-wide and relevant training activities; this is anchored in the PCDP and evaluated by the Supervisory Board (SB).

##### 1.4.2 Synergies between participating organisations

Research and training synergy are guaranteed by complementary expertise of REVOLUTION organisations (Table 3.4a); and the different domains of their work, i.e. academic, private sector and consultancy, non-governmental and (intra)governmental. Many have long histories of collaboration in research and training, and their synergies have proven valuable in past projects and joint PhD supervision. These include collaborations of FW and DUT in H2020 BRIGAD and TWIGA projects; joint supervision of PhD students by VUA, FTags, and RC; collaboration of BSC-CNS, FW, and VUA (incl. PhD supervision) in H2020 IMPREX project; an MoU in training and research between UTU and ARU (Geo-ICT, Resilience Academy); and training and hackathons between KCL, HOT-OSM, and RC.

**Whilst all organisations have successfully collaborated with at least one other REVOLUTION organisation, this proposal brings them all together in a unique and synergetic new network of networks.** By bringing together renowned institutes from the realms of water risks, with institutions focused on methodological aspects of novel data sources and approaches, citizen science, social media, machine learning, etc, we can develop new technologies not been achieved in past collaborations, allowing flood and drought risk monitoring and assessment to shift towards the so-called Fourth Paradigm of science<sup>3</sup>. For example, ESR1 will use HOT-OSM’s expertise on community mapping to create hyper-resolution elevation data by working with DUT and ARU. ESR10 will combine BSC-CNS’s experience with large data sources and machine learning, VUA’s knowledge on climate dynamics, and FW’s knowledge of the Júcar, to develop a seasonal drought impact forecasting tool. Using NASA’s data-fusion expertise,

ESR15 will develop scalable methods to integrate local knowledge in vulnerability mapping using UTU and KCL’s expertise in citizen science. The exploitation of organisations’ complementarities is further described in Section 3.4.1.

1.4.3 *Exposure of recruited researchers to different (research) environments, and the complementarity thereof*

The ESRs will be exposed to a transdisciplinary and multisectoral environment through: (1) the LL-approach, which promotes participatory, multi-stakeholder engagement for impact-based solutions; (2) solving real-world transdisciplinary problems faced by actual stakeholders during milestone training events; (3) continued engagement with stakeholders through the research workshops and the coupling of each ESR to a stakeholder throughout the project; (4) joint supervision of ESRs by supervisors at organisations from different sectors; (5) secondments to beneficiaries/partners with complementary expertise; (6) interactions and collaborations with other ESRs in REVOLUTION; and (7) dissemination and communication through the means described in Sections 2.3 & 2.4.

**2 Impact**

**2.1 Enhancing the career perspectives and employability of researchers and contribution to their skills development**

We will train a **new generation of highly-skilled professionals and researchers** with the disciplinary, transdisciplinary, transferable, and entrepreneurial skills required to implement the “*holistic, cross-sectoral approach rather than siloed action*”<sup>22</sup> that is required for flood and drought risk reduction. REVOLUTION’s LL-approach is designed to break down these siloes, ensuring that ESRs *must* take a holistic approach by: (1) having each ESR work closely with *at least* one stakeholder group throughout the project; (2) the series of WP-level research workshops; (3) the milestone training events in which ESRs apply newly-learned transdisciplinary skills to solve real-world problems; and (4) having all ESRs carry out secondments at organisations in different sectors. Moreover, our **global experts from science and practice** train our ESRs extensively in using innovative data, methods, and tools, specifically focusing on their application for designing DRR solutions. In doing so, we respond to the “*alarming shortage of data experts both globally and in the EU*” and the “*the lack of core intermediary expertise [which] has created a chasm between e-infrastructure providers and scientific domain specialists*”<sup>23</sup>.

A wide range of employers will benefit from REVOLUTION. In the short term, we **diversify and secure career prospects of the 15 ESRs through research-based and need-driven training**, and mentoring them in their search for leading positions. In the longer term, the new approach changes how we train future experts. **Our ESRs will be able to successfully gain employment in many sectors, due to their extensive skills sets.** Examples of career perspectives and needs are shown in Table 2.1a. There is a **strong possibility that some of our ESRs will continue their work in an entrepreneurial start-up, or by starting an own business.** Therefore, experience in entrepreneurship is included in the consortium through FTags, C2S, and ULabs, three innovative companies that are revolutionising disaster risk science and have won several innovation prizes. They provide experience and training on: balancing time spent on research and applications; business development; starting up (in) a start-up; teamwork; creativity; and gaining experience in how (when) to be persistent. Entrepreneurial skills are learnt in each of the network-wide training events (Table 1.2b). To further enhance entrepreneurial skills, each ESR will be encouraged to become member of a local innovation hub, e.g. through the Impact Hub network of over 16,000 entrepreneurs.

Table 2.1a: *Examples of career perspectives of REVOLUTION ESRs. \* REVOLUTION institutes shown in italics*

Sector	Needs	Possible employers*	REVOLUTION ESR skills	Evidence of labour market needs
Large firms & consultants	Employees who can develop novel location-based techniques and carry out risk analyses	Google, Royal Haskoning, Arcadis	Master innovative methods; combine established with novel tools and methods; user-centred	Employment of such professionals to increase 13% in next decade <sup>24</sup>
Governmental agencies	Staff with solid knowledge of flood and drought related decision-making	Governments & agencies (e.g. <i>CHJ, NASA, DLR, UKRI</i> )	Contextualise international agreements into actions; participatory approaches; stakeholder communication	Such professionals are scarce in more than half of EU Member States <sup>24a</sup>
NGOs & civil society organisations	Employees who use low-threshold technology, and work with local communities towards solutions	<i>HOT-OSM, RC, WFP, Solidaridad, Oxfam</i>	Operate at local levels; co-design solutions; transfer solutions across locations	Projected employment growth rate of 13.1% <sup>24</sup>
International organisations	Staff who thrive at the boundary between solution science and humanitarian practice	<i>UNDRR, World Bank, EU, World Resources Institute</i>	Co-design innovative solutions for risk reduction with local to global stakeholders; synthesis and transfer of knowledge; stakeholder communication	Evidenced by recent job solicitations from START Network and UN Famine Early Action Mechanism
Academic & other research institutes	Researchers who can translate science into applications, and establish links to practice	<i>Universities, DRES, JRC, BSC-CNS, IIASA</i>	Skills for linking science to societal challenges; profound domain-specific knowledge and interdisciplinary skills	Academic funding increasingly impact-focused (e.g. H2020 SC calls)
SMEs & start-ups	Entrepreneurial and solution-driven professionals	<i>FW, C2S, FTags, ULabs, Impact Hub, Startup Europe</i>	Synthesise entrepreneurial and scientific skills; identify societal challenges & translate to solutions	Europe’s start up market growing rapidly by fusing science and technology <sup>25</sup>

<sup>22</sup> Kofi Annan, 2018. No society can prosper without sustainable access to water, <https://www.kofiannanfoundation.org/articles/sustainable-water/>  
<sup>23</sup> EC, 2016. Realising the European Open Science Cloud. EC, Brussels, <https://ec.europa.eu/research/openscience/index.cfm?pg=open-science-cloud>  
<sup>24</sup> <https://skillspanorama.cedefop.europa.eu/en>  
<sup>25</sup> <https://www.forbes.com/sites/kjartanrist/2019/07/25/the-future-of-startups-is-in-europe/#631eb5078de9>

## 2.2 Contribution to structuring doctoral / early-stage research training at the European level and to strengthening European innovation capacity, including the potential for:

### 2.2.1 Contribution of partners, including the non-academic sector, to the research training

REVOLUTION leads to a step-change in cooperation in the field of applied flood and drought risk between academia, the private sector, NGOs, and (intra)governmental organisations (quadruple helix of social innovation). Non-academic organisations are involved at the highest level: **of the 5 institutes leading WPs, 2 are non-academic**. Moreover, ~40% of our REVOLUTION organisations are classed as non-academic by the EC, and several others carry out the majority of their duties outside the academic sector (DLR, DRES, HOT-OSM, NASA). Next to leading 2 WPs, they will: host, supervise, and co-supervise ESRs; give secondments to ESRs; provide specific input to all training events (Table 1.2c); organise, co-organise, and/or host our research workshops and milestone training events; and lead and take part in our dissemination and communication activities.

### 2.2.2 Developing a sustainable research and training network

REVOLUTION has taken measures to guarantee a sustainable research and training network, and as such will have an impact beyond the life-time of the ITN. Examples are described below:

- REVOLUTION will be **embedded within existing programmes at the organisations involved**, thereby contributing to organisational missions that continue after the project. Examples are: VUA's Science for Sustainability Theme, NERC urban disaster risk hub (via KCL), and DUT's Delft Global Initiative.
- We **directly contribute to policy from global to local level**, including EU policy (Section 2.2.3).
- The work is **fully embedded in the main practitioner and scientific networks** in the field, including: UNDRR's Global Risk Assessment Framework, Tanzania Urban Resilience Programme (TURP), Ramani Huria, Understanding Risk, Panta Rhei, FOSS4G, Global Flood Partnership, FATHUM, and IAHS.
- We envisage **many spin-off proposals** between the participating organisations and stakeholders. The clear linkage to global, EU, and national policies (Section 2.2.3) means that large amounts of funding will become available in the coming years. Indeed, the new contacts made through the development of this proposal have already led to several new grant bids and the joint supervision of MSc students on pilot projects.
- Our **distance learning resources** will be made available on our website and sites such as YouTube, to ensure that they can be used by the entire community beyond REVOLUTION's lifetime.
- We link our research to the EU's **Copernicus Emergency Management Service**. REVOLUTION contributes to improving and further developing CEMS by integrating research into operational systems.
- We will place emphasis on **"training the trainer"**. In this way, we ensure not only the training of highly skilled ESRs, but also the next generation of (Associate) Professors, directors, and so forth.
- In their final years, ESRs will be involved in - and receive training on - **writing research proposals**.
- ESRs develop a **long-term support network of peers** via involvement in REVOLUTION.

### 2.2.3 Strengthening European innovation capacity

**REVOLUTION will significantly contribute to innovation and R&D in Europe:**

- The EC<sup>26</sup> states that a *"1% increase of the rate of growth of the water industry in Europe could create between 10,000 & 20,000 new jobs"*. By seizing on growth, **Europe can become a global market leader in innovation, R&D, technology and solutions to flood and drought problems**. We train ESRs to achieve this (Section 2.1). In particular, by involving several tech-savvy start-ups, and training on entrepreneurship and business innovation, there is a strong possibility that ESRs will start their own business. This is further encouraged by each ESR being a member of a local *Impact Hub*, and organising a business innovation event with *Impact Hub Amsterdam*.
- REVOLUTION addresses several **Societal Challenges of the H2020 Work Programme**, such as *Climate action, environment, resource efficiency and raw materials* and *Europe in a changing world*. By developing new methods and tools, and training professionals and researchers with an entrepreneurial skills to develop these into products, we contribute to *"boosting EU competitiveness, growth and jobs in the water sector"*, an aim of H2020's Water Innovation focus area.
- As citizen science forms a key part of REVOLUTION, we respond to the **EC's Directorate-General for Research and Innovation's Open Science Policy Platform**, which states that<sup>27</sup> *"The engagement of citizens in research, policy making, and innovation should be encouraged at all levels..."*, with the recommendation to *"...promote research on Citizen Science..."*.
- We also contribute to two key R&D and innovation research activities of the EC, namely the **Copernicus Programme** and the **Copernicus Emergency Management Service**, which aim at providing information for emergency response in relation to different types of disasters. These are part of the EU's Copernicus Programme, aimed at developing information services based on satellite observation data.

<sup>26</sup> EC, 2012. A Blueprint to Safeguard Europe's Water Resources. COM(2012) 673 final. EC, Brussels

<sup>27</sup> EC, 2016. Recommendations of the OSPP on Citizen Science. EC, Brussels

**REVOLUTION will significantly contribute to EU and Member State policy strategies:**

- We co-develop new data, tools, and methods for monitoring progress related to the SFDRR, SDGs, and EU Water Framework Directive. Hence, the research is of **direct relevance to EU policy on DRR and sustainable development**. The SFDRR is at the heart of EU DRR policy, with the EU’s Action Plan<sup>28</sup> stating that it “...can act as a driver of innovation, growth and job creation...”. The EU aims to be frontrunner in implementing the SDGs, which are fully integrated in Europe’s policy framework<sup>29</sup>.
- WP2 supports the strategic priorities of the **Abidjan Declaration**<sup>30</sup> of the **Joint Africa-EU Strategy**, which stresses the importance of mobility of researchers for skills and knowledge development. This is achieved in REVOLUTION by: including a Tanzanian University (ARU) as beneficiary; including training in Tanzania which allows for Tanzanian students and researchers in our field campaigns and inviting Tanzanian students to our training events in Dar es Salaam.
- REVOLUTION contributes to EU policies on climate change adaptation, by: collecting data on exposure and vulnerability in innovative ways, which can inform the EC’s **Disaster Loss and Damage Working Group**; and improving climate-related risk knowledge relevant to the **EU Adaptation Strategy**.

**REVOLUTION will significantly contribute to policy strategies outside Europe, and hence business opportunities within Europe:**

- The Sendai Framework and SDGs are the most important international agreements on DRR and sustainable development internationally. Therefore, REVOLUTION’s policy relevance is also global.
- REVOLUTION will contribute to the **Tanzania 2015 Disaster Management Act**, by making communities more resilient to floods.
- REVOLUTION has indirect impact on international migration policy. The **UN Global Compact for Safe, Orderly and Regular Migration**<sup>31</sup>, calls to “*Minimize the adverse drivers...that compel people to leave their country of origin*”, and calls for programmes that accelerate fulfilment of the SDGs, including DRR.

**2.3 Quality of the proposed measures to exploit and disseminate the results**

Activities for effective exploitation, dissemination, and communication are brought together in WP5, and based on H2020 Guidelines<sup>32</sup>. All consortium members, including ESRs, will contribute actively to this during all phases of REVOLUTION. Our exploitation and dissemination activities focus on the practitioner and scientific community (Section 2.3) and our communication activities focus on the broader general public, including school children (Section 2.4). Specific tasks and deliverables are described in Tables 3.1a and b respectively. To increase visibility and create a common basis, we will develop a REVOLUTION design, including logo and templates for presentations. We will also develop a dedicated project website, which will be regularly updated and will include at least: overall REVOLUTION news; recruitment information for ESRs; description of each ESR and her/his project; links to our distance learning resources; latest news from the project; ESR blogs and vlogs; agenda; publications repository; and information about beneficiaries, partners, and involved stakeholders.

**2.3.1 Dissemination of the research results**

Dissemination to the **practitioner community** will focus on the private sector, (intra)governmental agencies, NGOs, and international development organisations and financing institutes. Activities include:

- Engagement with specific stakeholders and user-groups within each of the scientific WPs, through the **research workshops** (3 per scientific WP) in M14, 25, and 36.
- **Business innovation event**: organised with *Impact Hub Amsterdam*. ESRs and local entrepreneurs take up innovation challenges around the ESRs’ tools to refine them towards business solutions.
- **Final conference**: ESRs present results to a broad stakeholder network (scientific and practitioner). ESRs take an active role in organising the conference as part of their training (see Table 1.2b).
- REVOLUTION **side events** at industry meetings to engage in participative discussions on results and implications, such as World Bank Understanding Risk fora and regional Ministerial Conferences on DRR.
- **Policy briefs**: we will develop 3 policy briefs (aimed at audiences related to the 3 geographical scales of REVOLUTION, e.g. UN agencies, national, regional, and local governments, water authorities, business innovation hubs) that highlight key findings with concrete policy recommendations.
- **Relevant networks of beneficiaries and partners**: consortium members are involved in the most important practitioner networks in their fields, such as GRAF, Tanzania Urban Resilience Programme, UNDRR PreventionWeb, and Understanding Risk. ESRs will be actively involved in these communities, and use their networking and dissemination tools and events and facilities to disseminate results.

<sup>28</sup> EC, 2016. Action Plan on the Sendai Framework for Disaster Risk Reduction 2015-2030. SWD(2016) 205 final/2. EC, Brussels

<sup>29</sup> EC, 2016. Next steps for a sustainable European future. European action for sustainability, SWD(2016) 390 final. EC, Brussels

<sup>30</sup> AU and EU, 2017. Investing in Youth for Accelerated Inclusive Growth and Sustainable Development. AU-EU/Decl.1(V). AU/EU, Abidjan

<sup>31</sup> UN, 2018. Global compact for safe, orderly and regular migration. Final Draft. United Nations, New York

<sup>32</sup> [http://ec.europa.eu/research/participants/docs/h2020-funding-guide/grants/grant-management/dissemination-of-results\\_en.htm](http://ec.europa.eu/research/participants/docs/h2020-funding-guide/grants/grant-management/dissemination-of-results_en.htm)

- Each ESR will be assigned a **practitioner mentor**. These mentors present the co-created research at local meetings to ensure dissemination and uptake in their community.
- Co-authored **publications** between scientists and practitioners, which can be both peer-reviewed publications as well as white papers aimed at a non-technical audience.

Dissemination to the **scientific community** will include:

- **Peer-reviewed publications:** we aim for at least 3 first-author papers per ESR in Scopus-listed journals. The ESRs are supported by (co-)supervisors and institutions with outstanding publication records. We will also encourage joint publications of ESRs, and where possible ESRs will be invited to contribute with specific inputs to other papers from their research groups as co-authors. We envisage several **high-level papers**, for example a commentary paper in a journal such as *Nature Climate Change* **detailing overarching advances of REVOLUTION** (Milestone 9; Table 3.1c); several of the supervisors have extensive experience with this.
- **Oral and poster presentations at (inter)-national scientific conferences:** each ESR will attend, and present at, at least 1 international scientific conference per year, e.g. EGU, Adaptation Futures, FOSS4G.
- **Final conference:** see above, under dissemination to the practitioner community.
- **Model code:** open source model code will be made available via platforms such as GitHub.
- **Relevant networks of beneficiaries and partners:** consortium members are involved in the most important scientific networks in their fields. ESRs will be actively involved in these communities.

**Communication to the general public is described in Section 2.4.**

### **Data management**

REVOLUTION will participate in the open access to research data pilot of article 29.3 of the model Grant Agreement. This includes taking measures to make research data discoverable, accessible, assessable and intelligible, useable and interoperable. We use the “*as open as possible, as restricted as necessary*” principle in providing open access to data. We will develop and continually update a Data Management Plan (DMP) as part of WP7. Further information on the DMP and data management processes can be found in Section 3.2.8.

#### *2.3.2 Exploitation of results and intellectual property*

To increase ESR awareness on exploitation and Intellectual Property Rights (IPR), specific training will be provided by FW. As an active role of ESRs in the exploitation of results is essential, each ESR and her/his Supervisory Team will develop an exploitation plan as part of the PCDP (Section 3.2.4). The plan will comprise an overview of expected results and potential markets and users of the tools. IPR will be regulated in the Consortium Agreement, based on the DESCA Model. More information on the implementation of dealing with IPR is provided in Section 3.2.6. As the main science objective of REVOLUTION includes *co-developing novel data, tools, and methods*, there is large potential for exploitable results and IP. Whilst we strive to make our results open, commercial parties can add value to their clients by using them to offer tailored solutions and advice for designing DRR solutions. For example, the methods and tools developed to improve monitoring local flood conditions in Dar es Salaam in WP2 (by methods including satellites, video feeds, low-tech apps, and so forth) can be used by commercial parties to develop commercial monitoring systems in cities throughout the Global South facing similar flood issues. The algorithms developed to enable the use of online media in improving disaster risk knowledge can be used by specialist consultancies to provide tailored warning services for any location on Earth; indeed, FTags provides such consultancy services to its clients. The seasonal drought forecasting tool to be developed in WP3 can be used by insurers and/or buyers in the agricultural sector. For example, AgroSeguro, the main agricultural insurance company of Spain, has expressed interest and will be involved as stakeholder. The methods developed in WP4 can all be applied by consultancies to offer improved flood and drought *risk* assessment and advice to clients for any location on Earth. We will also collaborate with the experienced VUA Technology Transfer Office to ensure full exploitation potential.

## **2.4 Quality of the proposed measures to communicate the activities to different target audiences**

### *2.4.1 Communication and public engagement strategy*

Our LL-approach inherently ensures that we are constantly involved in two-way interaction and communication with a broad range of target audiences, including the public (including school children and local residents in our case studies), scientists, and the practitioner groups mentioned in Section 2.3; key elements are the WP-level research workshops and network-wide milestone training events (Section 1.2). As **citizen science** methods form the core of several ESR projects, the public are intrinsically involved in the research. This ensures that a transdisciplinary group (ESRs, beneficiaries, partners, stakeholders) have co-ownership of the work and that they will all participate in public communication and outreach. Throughout REVOLUTION, our **project website**, as described in Section 2.3, will play an important role in communication. **Each ESR will contribute at least 2 blogs/vlogs over the course of the project.** This allows us to post interesting, new, content monthly to the website, as well as develop the ESRs’ communication skills. An active **social media** presence with a devoted Twitter hashtag will be developed for the consortium; examples of specific Twitter campaigns are described below. This is especially relevant to our proposal,

since social media also forms an integral part of several ESR research projects. **To make our communication and public engagement strategy as effective as possible, and intricately linked to the LL-approach, we will perform specific activities tailored to each of the 4 steps of our LL-approach.**

During the *problem definition phase*, consortium members and ESRs will interact with the practitioner community and the public to identify critical needs that can shape the research. This will include:

- **Social media campaign** to gather ideas from public. This includes inspirational tweets, with provocative questions, e.g. “What do you wish you’d done to prepare for [recent flood/drought] in your region?”
- The initial research workshops per WP and the hands-on, real-world problem solving in Dar es Salaam as part of milestone training event 1. The former involves a broad range of practitioners actively involved in flood and drought management from WP2-4. The latter includes **participation of Tanzanian students from ARU, and serious gaming with Tanzanian school children and communities**. We will invite **local media** (through ARU, RC, and World Bank) to attend part of the fieldwork and final presentations.

During the *data collection and analysis phase*, (co-)supervisors will support ESRs to gradually take on a lead communication role, representing the face of REVOLUTION and developing their skills. This will include:

- An **applied improvisation course** in milestone training event 4.2 (Table 1.2b), specifically designed for the ESRs to support them in reacting *on their feet* with clear answers to live audiences or classrooms.
- Each ESR giving at least 1 presentation/class on their approach and results to a **local primary or secondary school**. Moreover, ESRs in WP2 will give **presentations/classes in schools in Dar es Salaam**.
- Active participation in the **EGU Geosciences for Teachers Programme**.
- Inviting **local media** to cover 2<sup>nd</sup> and 3<sup>rd</sup> research workshops and milestone training events 2 & 3.
- Participation in **Euroscience Open Forum events** and **European Researchers’ Nights**. ESRs will lead a proposal to organise 1 European Researcher Night.; this is facilitated by the course on writing proposals in milestone training event 4.2 (Table 1.2b), where the proposal serves as a hands-on learning experience.

During the *solution evaluation and refinement and knowledge transfer phases*, activities include:

- Each ESR writing **1 popular science article**, to submit to (inter)national magazines and newspapers.
- **Knowledge clips and web lectures** developed by ESRs and published via our website and YouTube.
- **Business innovation event** held with *Impact Hub Amsterdam*, connecting ESRs to businesses in the Netherlands working on sustainability issues, through innovation challenges.
- Making all REVOLUTION **online training resources** available via project website.
- Linking all communication and dissemination to **existing knowledge management programmes**, including: Building Resilience and Adaptation for Climate Extremes and Science for Humanitarian Emergencies and Resilience. These are led by RC, who can set up webinars and public articles.
- **Social media campaign** to gather ideas for further research, setting out potential spin-off proposals. This includes a series of inspirational water-related tweets, followed by provocative questions, e.g. “Why do you think that cleaning drains in Dar es Salaam will reduce flood risk more than building levees?”
- Final conference (see Section 2.3.1): we will invite **media** to attend, via the network of VUA. It will be **promoted by the student-led Green Office of VUA** and featured in the **Amsterdam Science magazine**.

## 2.5 Steps needed to bring about impacts, risk and mitigation strategy

Progress towards impacts will be evaluated and monitored according to the management structure and procedures in Section 3.2.1. In Table 2.5a, we list mitigation strategies to key potential risks specifically relating to the impact of REVOLUTION. Our mitigation strategy relating to project implementation is in Table 3.2b.

*Table 2.5a: Risk and mitigation strategy related to achieving impacts*

External factors	Mitigation strategy
Other research projects in similar fields may duplicate or fragment efforts	RC leads several knowledge management roles in R&D consortia, including BRACED and SHEAR, and will use these to ensure cooperation and avoid duplication. REVOLUTION is actively involved in key networks and communities. Hence, we can identify existing efforts to create synergy.
Results not implemented by external stakeholders	REVOLUTION is explicitly designed to avoid this risk, through its LL-approach. This ensures that research is tailored to stakeholder needs.
ESRs overwhelmed by coordinating with such a transdisciplinary team	Each ESR has a clearly designated ESR Supervisory Team, and supervisors experienced in transdisciplinary work. They ensure that ESRs are supported in knowing when to reach out to collaborators. Milestone training events include transferable skills that are applied in practice.
IPR conflict of interest between institutes	IPR has been discussed with all beneficiaries/partners during proposal writing and will be addressed in the Consortium Agreement (Section 3.2.6), therefore this is unlikely. Eventual conflict resolution takes place in the Supervisory Board, in collaboration with legal offices of involved partners where required.

### 3 Quality and Efficiency of the Implementation

#### 3.1 Coherence and effectiveness of the work plan

##### 3.1.1 Work Packages description

REVOLUTION is structured in 7 WPs. Training is coordinated in WP1, scientific activities are carried out in WP2-4, dissemination and communication are coordinated in WP5, results from across REVOLUTION are synthesised in WP6, and overall management and coordination are carried out in WP7 (Fig. 1.1a). **The LL-approach has been designed to ensure that REVOLUTION operates as a coherent whole**, with training, research, and communication following the same 4 steps. This requires an intricate linkage between activities, which will be achieved and monitored by regular (online and in-person) meetings of the Executive Board (Section 3.2.1). Activities of individual WPs are described in Table 3.1a.

Table 3.1a: Description of Work Packages

WP no.	1	Start month – End month	1-48
WP title	Training		
Lead Beneficiary	UTU (WP leader: Prof. Niina Käyhkö)		
Objectives	(1) Coordinate training programme to be in line with overall research training and career objectives (2) Develop PCDPs and coordinate their writing and approval (3) Develop and conduct the network-wide and wildcard training events (4) Develop distance learning resources		
Description of work	ESRs involved		ESR1-15
WP1 is concerned with overall coordination of the entire training programme, and as such is pivotal to the success of REVOLUTION. The activities are broken down into 4 main tasks, described below.			
T1.1	Develop online catalogue of online training resources	Lead partner (bold) and participants	UTU, all
In M2-8, an inventory of relevant distance training resources (from within and outside the consortium) that could be used by the ESRs will be made. This commences during the start-up meeting (M2) and is expanded by all consortium members until M8. The inventory is used to develop an online catalogue of distance training resources (D1.2), which will be shared with the ESRs during the kick-off.			
T1.2	PCDP development	Lead partner (bold) and participants	UTU, all beneficiaries
A PCDP template will be developed in M1 by the Executive Board, led by the Training Development Officer. It will be refined during the start-up meeting (M2). The template will be introduced to ESRs during the kick-off and completed by all ESRs by M12. WP1 coordinates the review and approval of PCDPs by the Supervisory Board (D1.4). After approval, PCDP implementation is the responsibility of ESR Supervisory Teams, monitored by the Executive Board.			
T1.3	Develop and conduct network-wide training events	Lead partner (bold) and participants	UTU & training event leads, all beneficiaries and partners
Overall development of network-wide training events is the responsibility of the Executive Board, coordinated by UTU. For each event, a lead beneficiary is assigned; they coordinate the development and conduction of the event. For the milestone training events, a local host is assigned to coordinate local logistics. Lead beneficiaries, local hosts, and content of each network-wide training event are shown in Table 1.2b.			
T1.4	Develop distance learning resources	Lead partner (bold) and participants	UTU, all beneficiaries and partners
Overall development of distance learning materials (including mini-MOOCs) is the responsibility of the Executive Board, coordinated by UTU. For each skill content, a lead beneficiary or partner will be assigned, who reports to the Executive Board. Distance learning courses will be made available to RC, for inclusion on the website. By the end of REVOLUTION, all distance learning courses will be documented online.			
Deliverables			
No.	Short Description	Month	
D1.1	Training course 1.1 (part of start-up meeting)	2	
D1.2	Online catalogue of distance training events	8	
D1.3	Training course 2.1 and 2.2 (part of kick-off meeting)	9	
D1.4	All Personal Career Development Plans (PCDPs) approved by Supervisory Board	14	
D1.5	Training course 3.1 and 3.2 (milestone training event 1)	14	
D1.6	Training course 4.1 and 4.2 (milestone training event 2)	25	
D1.7	Training course 5.1 and 5.2 (milestone training event 3)	36	
D1.8	Distance learning final course documentation	48	
WP no.	2	Start month – End month	9-48
WP title	Local		
Lead Beneficiary	DUT (WP leader: Prof. Hessel Winsemius)		
Objectives	(1) Co-develop local scale observation and risk monitoring and assessment data, tools, and methods that are specifically tailored towards designing and assessing disaster preparedness and response at the local scale (2) Apply the data, tools, and methods with stakeholders in Dar es Salaam (3) In doing so, contribute to Sendai Framework Priority 1 and targets a,b,c,d,g; and SDGs 5.8, 11.1, 11.5, 13.1, 13.3		
Description of work	ESRs involved		1-5
The work is carried through the four steps of our LL-approach, using the city of Dar es Salaam (Tanzania) as case study. The WP2 research workshops relating to the LL-steps will be hosted by ARU as side-events of Tanzania Urban Resilience Programme Advisory Board meetings, and their content developed under the lead of DUT. Each ESR will work together with (at least) one of the stakeholders from the initial research workshop. The ESRs will employ a wide range of data, methods, and tools, including: simple sensors that were originally designed for other purposes, e.g. smartphones, cameras, and videos; drone-based technology; online media; community-mapping and citizen science approaches; and machine learning techniques, and new low-cost methods such as low-cost high-accuracy GPS sensing. Individual ESR projects are described in Table 3.1d.			
T2.1	Community-based elevation and drainage data for neighbourhood scale flood modelling	Lead partner (bold) and participants	DUT, HOT-OSM, ARU
T2.2	Citizen science to understand dynamic changes of local conditions on flood risk	Lead partner (bold) and participants	KCL, DRES, ARU
T2.3	Mapping flow conditions and solid waste from image and video data using computer vision techniques	Lead partner (bold) and participants	ARU, ULabs, UTU
T2.4	Participatory mapping of multidimensional values and practices of vulnerability in local communities	Lead partner (bold) and participants	UTU, ARU, RC



**REVOLUTION – ETN**

T2.5	Real-time flood risk forecasting for forecast-based humanitarian action	Lead partner (bold) and participants	RC, DUT, JRC
No.	Short Description		Month
D2.1	Report on research workshop 1, including minutes and refined research questions		15
D2.2	Interim report summarising progress on 5 ESR projects and minutes of research workshop 2		26
D2.3	Minutes of research workshop 3		37
D2.4-D2.8	Final reports on individual ESR projects		45
D2.9	White paper synthesising results across WP		48
WP no.	3	Start month – End month	9-48
WP title	Regional		
Lead Beneficiary	FW (WP leader: Dr. Johannes Hunink)		
Objectives	(1) Co-develop risk monitoring and assessment data, tools, and methods that are specifically tailored towards monitoring and forecasting risk at the European and river basin scales (2) Apply the data, tools, and methods with stakeholders in the Júcar river basin and European Drought Observatory (EDO) (3) In doing so, contribute to Sendai Framework Priority 1 and targets a,b,c,g; SDG targets 2.4, 3.d, 6.4, 11.5, 13.1, and 13.3; EU Water Framework Directive		
Description of work	ESRs involved		6-10
The work is carried through the four steps of our LL-approach, using the Júcar river basin and European scale as case studies. The WP3 research workshops relating to the LL-steps will be hosted by JRC as side-events of annual EDO stakeholder meetings, and CHJ. Each ESR will work together with (at least) one of the stakeholders from the initial research workshop. They will apply the new methods and tools to demonstrate their added value for drought risk monitoring and forecasting at both the river basin and continental scale. The ESRs will employ a wide range of data, methods, and tools, including: satellite data from recently launched missions (e.g. Sentinel), online media (e.g. Twitter), socio-hydrological and agent-based modelling data, citizen science approaches, and Machine Learning techniques. Individual ESR projects are described in Table 3.1d.			
T3.1	Incorporating groundwater in drought risk assessment	Lead partner (bold) and participants	ALU-FR, UKRI, JRC
T3.2	Socio-hydrological modelling of groundwater use to improve regional drought risk management	Lead partner (bold) and participants	UU, VUA, CHJ
T3.3	Assessing socio-economic drought risk from impact functions	Lead partner (bold) and participants	FW, ALU-FR, JRC
T3.4	Social media for early warning of drought events	Lead partner (bold) and participants	VUA, FTags, FW
T3.5	Improving risk-based seasonal drought forecasts	Lead partner (bold) and participants	FW, VUA, BSC-CNS
No.	Short Description		Month
D3.1	Report on research workshop 1, including minutes and refined research questions		15
D3.2	Interim report summarising progress on 5 ESR projects and minutes of research workshop 2		26
D3.3	Minutes of research workshop 3		37
D3.4-D3.8	Final reports on individual ESR projects		45
D3.9	White paper synthesising results across WP		48
WP no.	4	Start month – End month	9-48
WP title	Global		
Lead Beneficiary	VUA (WP leader: Prof. Philip Ward)		
Objectives	(1) Co-develop data, tools, and methods to enrich global risk monitoring and assessment by utilising datasets that are rich in local information and can be applied globally (2) Apply the data, tools, and methods within the GLOFRIS global flood risk model and embed the outcomes within UNDRR's Global Risk Assessment Framework (3) In doing so, contribute to Sendai Framework Priority Action 1 and targets a,b,c,d,g; and SDG targets 3.d, 6.4, 11.5, 13.1, and 13.3		
Description of work	ESRs involved		11-15
WP4 will develop methods and tools that utilise new datasets that are rich in information at the local scale but can be scaled globally. As the current global flood risk models have many limitations, there is a need for high-resolution, comprehensive global flood risk models. Combining a wide range of traditional and novel data, methods, tools, and platforms is required to address those limitations. These improved models are necessary to assess the achievements of international frameworks such as the SDGs and the Sendai Framework targets. Therefore, WP4 will embed the LL-approach embedded in the Global Risk Assessment Framework (GRAF), a framework for supporting decision-makers to achieve the Sendai Framework targets. The research workshops will be hosted by UNDRR and JRC, as side-events of annual GRAF meetings and Global Flood Partnership conferences. Workshop content will be developed under the lead of VUA. The ESRs will employ a wide range of data, methods, tools, and platforms including: satellite and radar data; imagery from drones and Google Street View-like platforms; online media; global flood models; citizen science approaches; and machine learning. Synergy between all WP4 ESR projects will be achieved by integrating results into the GLOFRIS global flood risk model. Individual ESR projects are described in Table 3.1d.			
T4.1	Comprehensive global flood mapping	Lead partner (bold) and participants	VUA, C2S, FTags
T4.2	Flood depth estimation from fusion of DEM and radar imagery	Lead partner (bold) and participants	DLR, UTU, DUT
T4.3	Detecting human-made flood protection structures through machine learning	Lead partner (bold) and participants	DUT, DRES, DLR
T4.4	Improved exposure characterisation of buildings using machine learning	Lead partner (bold) and participants	DLR, VUA, NASA
T4.5	Integrated flood vulnerability mapping with local spatial knowledge, earth observation data and deep learning algorithms	Lead partner (bold) and participants	UTU, KCL, NASA
No.	Short Description		Month
D4.1	Report on research workshop 1, including minutes and refined research questions		15
D4.2	Interim report summarising progress on 5 ESR projects and minutes of research workshop 2		26
D4.3	Minutes of research workshop 3		37
D4.4-D4.8	Final reports on individual ESR projects		45
D4.9	White paper synthesising results across WP		48
WP no.	5	Start month – End month	1-48
WP title	Dissemination and communication		
Lead Beneficiary	RC (WP leader: Dr. Erin Coughlan de Perez)		
Objectives	(1) Ensure effective dissemination of results to the scientific and practitioner community (2) Ensure effective two-way communication with stakeholders and general public (3) Ensure legacy of REVOLUTION results		
Description of work	ESRs involved		All
WP5 ensures effective and efficient dissemination and communication to the scientific and practitioner community, and general public. Our LL-approach ensures a constant two-way interaction with stakeholders. During the recruitment phase (M1-8), a REVOLUTION identity and design will be developed, as well as a detailed dissemination, exploitation, and communication plan (Task 5.1). The project website will also be setup, and regularly updated throughout the project (Task 5.2). Specific targeted dissemination and two-way communication activities are collected together under Task 5.3, including those activities specifically designed to ensure the legacy of REVOLUTION. Our final conference and business innovation event are organised and carried out in Task 5.4.			

## REVOLUTION – ETN

T5.1	Develop REVOLUTION identify and design, and detailed dissemination, exploitation, and communication plan	Lead partner (bold) and participants	RC, all
The first activity is the development of our identity and design (D5.1), which includes: overall REVOLUTION storyline, logo, and templates for presentations and other media activities. For sustainability reasons, we choose <b>not</b> to develop physical project flyers for distribution at conferences - electronic resources will be used. During this phase, a detailed dissemination, exploitation, and communication plan will be developed (D5.2). This will be discussed at the start-up (M2) and finalised with input from all beneficiaries/partners by M5.			
T5.2	REVOLUTION website	Lead partner (bold) and participants	RC, content from all
A project website will be developed and will go live by M5 (D5.3). After launch, it will be regularly updated, with each beneficiary and partner being granted specific rights and responsibilities as set out in the dissemination, exploitation, and communication plan. As the ESRs form the heart of REVOLUTION, they play a central role in keeping the website up to date; this includes making at least 2 blogs/vlogs during the project.			
T5.3	Targeted dissemination and communication activities	Lead partner (bold) and participants	RC, all
This task concerns coordination of dissemination and communication modalities (Section 2.3 & 2.4), including: side-events and scientific and practitioner meetings and conferences; practitioner mentors; scientific and practitioner-oriented papers and presentations; online media presence and targeted Twitter campaigns; serious gaming with local communities; teaching at local schools; participation in EGU Geosciences for Teachers Programme; local media; European Researcher's Nights. Links to all publications will be added to the website and checked annually (D5.4). To ensure legacy, we ensure that: our research is embedded in main scientific and practitioner networks; 3 policy briefs are published (D5.6); and distance learning resources are online (D5.7).			
T5.4	Final conference and business innovation event	Lead partner (bold) and participants	RC, all
A final conference and business innovation event (1-day each) will be held in Amsterdam (D5.5). The focus is on research impacts and ESR future careers. The ESRs will take an active role in organising the final conference in order to put learnt skills into action. The business innovation event will be organised by the ESRs together with <i>Impact Hub Amsterdam</i> , who will also invite relevant entrepreneurs and professionals from their national and global networks.			
Deliverables			
No.	Short Description		Month
D5.1	REVOLUTION identity and design		3
D5.2	Detailed dissemination, exploitation, and communication plan		5
D5.3	REVOLUTION website launched		5
D5.4	Links to all scientific and practitioner papers and presentations. Updated and checked for completeness		12, 24, 36, 48
D5.5	Final conference and business innovation event		45
D5.6	Three policy briefs		48
D5.7	All distance training resources available online		48
WP no.	6	Start month – End month	1 – 48
WP title	Synthesis		
Lead beneficiary	VUA (WP leader: Prof. Philip Ward)		
Objectives	(1) Foster synthesis and integration across WP1-5 (2) Contextualise REVOLUTION results in broader scientific risk framework (3) Provide key science recommendations and perspectives		
Description of work	ESRs involved	All	
WP6 ensures that the novel data, tools, and methods from across REVOLUTION are synthesised and integrated across the WPs, and contextualised in terms of their contribution to improving risk science and the development of DRR solutions. This is facilitated through a straightforward and effective set of 3 tasks.			
T6.1	Iterative contextualisation and reflection	Lead partner (bold) and participants	RC; all
At each step of the LL approach, each ESR will critically reflect on how her/his work is contextualised within the scientific risk framework. A living REVOLUTION synthesis document will be updated iteratively throughout REVOLUTION, which will eventually provide information for the high-level synthesis paper in T6.3. An initial template for the living document will be designed prior to the start-up meeting, and finalised prior to the kick-off meeting in M9. It will be presented and explained to the ESRs during the kick-off, and each ESR will update the document during each of the four LL-steps. This will also allow for review during SB meetings.			
T6.2	REVOLUTION thematic special issue and conference session	Lead partner (bold) and participants	DUT; all
We will organise a special issue in a scientific journal, and a session at an external conference (e.g. EGU), around the scientific theme of REVOLUTION. The aim is to ensure that the integration of REVOLUTION results with other related advances within the field. In doing so, the network of networks can be expanded beyond the initial REVOLUTION beneficiaries and partners. The special issue guest editors will be the EB members, plus selected SB members. The conference session will be led by a group of the ESRs, mentored by Research Development Officer Prof. Hessel Winsemius. Both the special issue and conference sessions will be open for submission from within and outside REVOLUTION.			
T6.3	Production of high-level scientific synthesis and perspective paper	Lead partner (bold) and participants	VUA; all
Using the input from T6.1, the key findings of REVOLUTION will be synthesised into a high-level commentary/perspective paper for submission to a journal such as Nature Climate Change, Nature Sustainability, or similar journal. Based on key findings related to specific innovations, the SB and AB will monitor and identify opportunities for additional specific high-level papers, and agree on lead authors.			
Deliverables			
No.	Short Description		Month
D6.1	Living REVOLUTION synthesis document – template		6
D6.2	White paper on thematic special issue and conference session		45
D6.3	Living REVOLUTION synthesis document – final version		45
D6.4	REVOLUTION high-level perspective manuscript		48
WP no.	7	Start month – End month	1 – 48
WP title	Management and coordination		
Lead beneficiary	VUA (WP leader: Prof. Philip Ward)		
Objectives	(1) Efficiently manage REVOLUTION so that objectives in other WPs can be achieved (2) Establish a transparent recruitment procedure and recruit competitive ESRs (3) Communicate with and report to the European Commission		
Description of work	ESRs involved	n/a	
WP7 concerns coordination and overall management and enables the work in all other WPs to run smoothly and coherently. Communication within the consortium as well as with the European Commission will also be coordinated in this WP.			
T7.1	Organise an efficient project structure	Lead partner (bold) and participants	VUA; all
Management and overall coordination by VUA will enable activities in all WPs to be performed timely, coherently, and efficiently. This will entail at least the following: (1) development of Consortium Agreement; (2) development and updating of Data Management Plan; (3) planning and organisation of project board meetings (for overview of boards, see Section 3.2.1); (4) active progress monitoring of objectives, deliverables, milestones, and alignment between WPs; (5) internal communication; and (6) overall ethical, legal, financial, and administrative management.			
T7.2	Coordination of ESR recruitment	Lead partner (bold) and participants	VUA; all beneficiaries
Establish the Recruitment Committee (RCie) and coordinate all RCie activities, i.e. announcement of positions, pre-selection of candidates, communication of final selected candidates to Supervisory Board for final approval, communication to rejected candidates.			

## REVOLUTION – ETN

T7.3	Reporting to the European Commission (EC)	Lead partner (bold) and participants	VUA
VUA will act as liaison between the project consortium and the EC representatives. Activities include: (1) collecting and processing data from consortium members on activities in their WPs; (2) processing all technical, financial, and administrative information into project periodic and final reports compliant with EC criteria; and (3) sending interim reports as well as final report to the EC.			
Deliverables			
No.	Short Description	Month	
D7.1	<b>Consortium Agreement:</b> Final version of the CA submitted to the REA	3	
D7.2	<b>Data management plan:</b> Analysis of main elements of the data management policy	5	
D7.3	<b>ESR recruitment completed:</b> All 15 individual ESR contracts are signed ESRs recruited	8	
D7.4	<b>Researcher Declarations on Conformity:</b> signed by all ESR and uploaded to Portal	9	
D7.5	<b>Mid-term progress report:</b> Interim report sent to EC describing progress in research, training, and impact	27	
D7.6	<b>Final report:</b> Final report sent to the EC summarising all research, training, and impact	48	

### 3.1.2 List of major deliverables

Table 3.1b: Deliverables list

Scientific Deliverables		WP no.	Lead beneficiary short name	Type <sup>33</sup>	Dissemination level <sup>34</sup>	Due date
No.	Title					
D6.1	Living REVOLUTION synthesis document – template	6	RC	R	CO	6
D2.1, 3.1, 4.1	Report on research workshop 1, including minutes and refined research questions	2,3,4	DUT (D2.1), FW (D3.1), VUA (D4.1)	R	PU	15
D2.2, 3.2, 4.2	Interim report summarising progress on 5 ESR projects and minutes of research workshop 2	2,3,4	DUT (D2.2), FW (D3.2), VUA (D4.2)	R	PU	26
D2.3, 3.3, 4.3	Minutes of research workshop 3	2,3,4	DUT (D2.3), FW (D3.4), VUA (D4.5)	R	PU	37
D2.4-2.8 D3.4-3.8 D4.4-4.8	Final reports on individual ESR projects	2,3,4	ESR Host Beneficiaries (Table 3.1d)	R	PU	45
D6.2	White paper on thematic special issue and conference session	6	DUT	R	PU	45
D6.3	Living REVOLUTION synthesis document – final version	6	RC	R	PU	45
D2.9, 3.9, 4.9	White paper synthesising results across WP	2,3,4	DUT (D2.9), FW (D3.9), VUA (D4.9)	PDE	PU	48
D6.4	REVOLUTION high-level perspective manuscript		VUA	PDE	CO*	48
Management, Training, Recruitment, and Dissemination Deliverables		WP no.	Lead beneficiary short name	Type	Dissemination level	Due date (M)
No.	Title					
D1.1	Training course 1.1	1	VUA	OTHER	CO	2
D5.1	REVOLUTION identity and design	5	RC	ADM	CO	3
D7.1	Consortium Agreement	7	VUA	ADM	CO	3
D5.2	Detailed dissemination, exploitation & communication plan	5	RC	R	CO	5
D5.3	REVOLUTION website launched	5	RC	ADM	PU	5
D7.2	Data management plan	7	VUA	PDE	CO	5
D1.2	Online catalogue of distance training events	1	UTU	OTHER	CO	8
D7.3	ESR recruitment completed	7	VUA	ADM	CO	8
D7.4	Researcher Declarations on Conformity	1	VUA	ADM	CO	9
D5.4	Links to all papers and presentations	5	RC	PDE	PU	12,24,36,48
D1.3	Training course 2.1 and 2.2	1	VUA	OTHER	CO	9
D1.4	All PCDPs approved by Supervisory Board	1	VUA	ADM		14
D1.5	Training course 3.1 and 3.2	1	DUT	OTHER	CO	14
D7.5	Mid-term progress report	7	VUA	R	PU	27
D1.6	Training course 4.1 and 4.2	1	VUA	OTHER	CO	25
D1.7	Training course 5.1 and 5.2	1	FW	OTHER	CO	36
D5.5	Final conference and business innovation event	5	RC	PDE	PU	45
D1.8	Distance learning final course documentation	1	UTU	PDE	PU	48
D5.6	Three policy briefs	5	VUA	PDE	PU	48
D5.7	All distance training resources available online	5	RC	PDE	PU	48
D7.6	Final report	7	VUA	R	PU	48

### 3.1.3 List of major milestones

Table 3.1c: Milestones list

Milestones		Related WP(s)	Lead beneficiary short name	Due date	Means of verification
No.	Title				
MS1	Kick-off meeting completed	1	VUA	2	Meeting minutes
MS2	Website online	5	RC	5	Website online and available to public
MS3	All ESRs recruited	2	VUA (& all)	6	15 signed contracts
MS4	PCDPs approved	1	VUA	14	15 PCDPs by Supervisory Board
MS5	LL step 1 completed (Problem definition)	1-6	All	25	RW1 <sup>35</sup> completed (minutes); 15 ESR papers submitted; ESRs reported to SB/AB at MTE2 <sup>36</sup> ; 9 blogs

<sup>33</sup> R = Report; ADM = Administrative; PDE = dissemination and/or exploitation of project results; OTHER = Other.

<sup>34</sup> PU = Public, fully open; CO = Confidential, restricted under conditions set out in Model Grant Agreement; CI = Classified, information as referred to in Commission Decision 2001/844/EC.

\* REVOLUTION high-level perspective manuscript will be confidential until published in open-access journal

<sup>35</sup> RW = Research workshop

<sup>36</sup> MTE = Milestone Training Event

REVOLUTION – ETN

MS6	LL step 2 completed (Data collection and analysis)	1-6	All	36	RW2 <sup>45</sup> completed (minutes); 30 ESR papers submitted; ESRs reported to SB/AB at MTE3 <sup>46</sup> ; 18 blogs
MS7	LL step 3 completed (Solution evaluation and refinement)	1-6	All	45	RW3 <sup>45</sup> completed (minutes); 45 ESR papers submitted; ESRs reported to SB/AB at M45 meeting; 27 blogs
MS8	LL step 4 completed (Knowledge transfer)	1-6	All	48	Final conference (presentations on scaling and utilisation); 50 ESR papers & high-level commentary submitted; 30 blogs; distance learning resources online
MS9	REVOLUTION high-impact perspective paper	6	VUA	48	Paper submitted to high-impact journal

3.1.4 Fellow’s individual projects, including secondment plan

A description of individual ESR projects, including main approach, results, and secondment arrangements is provided in Table 3.1d.

Table 3.1d: Individual research projects

Fellow	Host institution	PhD enrolment	Start date	Duration	Deliverables
ESR 1	DUT	Y (DUT)	Month 9	36 months	D2.4
Project title	Community-based elevation and drainage data for neighbourhood scale flood modelling			Related to WP	WP2
Objectives: <b>ESR1 will co-develop a method to generate highly accurate elevation and positioning data with local people, local devices and open knowledge by using drones, mobile phones with low-cost sensors, and open-source software platforms.</b> These data are essential for designing flood risk solutions at the locally relevant scale of individual buildings and critical infrastructure. This is achieved by: (1) developing/complementing smartphone- and other low-cost sensing methods and software to establish ground control points, bathymetric surveys and terrain surveys through low-cost high-accuracy GPS working in both 4G connected and remote areas; (2) developing point cloud matching techniques to merge a Structure-from-Motion photogrammetry point cloud with ground control point clouds; (3) rigorous error analysis against benchmark datasets (e.g. LIDAR or RTK-enabled photogrammetry); (4) demonstration of use in flood modelling in a Dar es Salaam neighbourhood with Resilience Academy partner University of Dar es Salaam.					
Expected results: (1) Neighbourhood scale high resolution elevation data; (2) Neighbourhood scale flood hazard models based on new terrain and bathymetry mapping; (3) Enhanced capabilities of community mapping groups to map elevation and locations using low-cost prototype sensors and software					
Planned secondment(s): (1) HOT-OSM (M16-20) to cover the human interfacing of the sensor method and data platform; (2) ARU (M13-14 & 34-36) transfer of method in community mapping practice					
Risk management: Commercial rollout of smartphones with dual frequency GPS technology is expected during REVOLUTION. If rollout is delayed, DUT has access to development level technology, and can develop the platform to be ready once incorporation of dual frequency GPS in smartphones has effectuated					
Enrolment in doctoral degree: DUT					
Fellow	Host institution	PhD enrolment	Start date	Duration	Deliverables
ESR 2	KCL	Y (KCL)	Month 9	36 months	D2.5
Project title	Citizen science to understand dynamic changes of local conditions on flood risk			Related to WP	WP2
Objectives: <b>ESR2 will co-develop a method to assess causal factors of flood risks from neighbourhood to basin scale and assess the impact of local measures by, for the first time, only using community mapped data.</b> This will ensure that flood risk models can be more effectively used to monitor changing risk in the rapidly changing context of urban development in the Global South, since the community mapping approach both helps to fill a gap of limited data, as well as increase local capacity to continuously update flood risk models. This is achieved by: (1) developing a flood model generation procedure and flood impact models based on existing Voluntary Geographical Information (VGI) data sources (e.g. OpenStreetMap); (2) using the model with community mapped data to assess the influence of local conditions in flood-causing factors on flood risk, including community surveys of soil types and erosion and sedimentation potential, solid waste accumulation, and increase in exposure; (3) assessing impacts of local measures on flooding; (4) assessing the value of the detailed community mapped information in the flood risk model by comparative benchmark experiments with and without the data.					
Expected results: (1) Urban flood risk model including drainage infrastructure, solid waste, urbanisation, and climatic conditions for Dar es Salaam; (2) Automated procedure to keep model and data up to date; (3) Training resources to support transfer to Tanzania Resilience Academy, as well as other cities					
Planned secondment(s): (1) DRES (M17-21) to carry out hydraulic modelling; (2) ARU (M13-14 & 34-36): to embed model into practice and in curricula					
Risk management: To mitigate the risk of limited community backing, mapping methods are implemented in curricula of the Resilience Academy. We will continually consult with local partners and build on existing connections to ensure the modelling approach is co-produced and sustainable					
Enrolment in doctoral degree: KCL					
Fellow	Host institution	PhD enrolment	Start date	Duration	Deliverables
ESR 3	ARU	Y (ARU)	Month 9	36 months	D2.6
Project title	Mapping flow and solid waste from camera & video data using computer vision			Related to WP	WP2
Objectives: <b>ESR3 will co-develop a real-time urban river observatory, by using methods that combine location-based mobile and stationary video and camera data (collected for example using mobile phones) with human intelligence and machine learning capacities.</b> This is essential for designing flood management measures in informal settlements, as it will allow communities to effectively monitor flows and flow impediments due to sediment and solid waste accumulation, which have a strong impact on flood processes. Formal observations would be expensive and difficult to organize and institutionalise, and we address this by using Internet-of-Things (IoT) and social media platforms instead. This is achieved by: (1) training computer vision techniques based on machine learning algorithms to convert image data into meaningful judgment of flooding conditions; (2) benchmarking and comparing visual image/video interpretation and flow condition judgments with computer vision capacities against established methods; and (3) investigating the value of using online shared camera feeds for operational flow condition mapping and response planning.					
Expected results: (1) Observatory of real-time conditions, piloted in Dar es Salaam; (2) Mobile and stationary flood condition mapping methods developed based on active and passive images/video data and machine learning methods, validated using traditional observation methods; (3) Assessment of value of data when operationalised in Dar es Salaam or similar cities					
Planned secondment(s): (1) ULabs (M15-20) to establish computer vision and machine learning methods with video feeds on-site; (2) UTU (M33-36) to transfer the method in community mapping practice and to establish value proposition					
Risk management: seasonal and location specific variations could challenge the usability of the result. However, the use of long term data on waste and rainfall that is already in the country will improve the results					
Enrolment in doctoral degree: ARU					
Fellow	Host institution	PhD enrolment	Start date	Duration	Deliverables
ESR 4	UTU	Y (UTU)	Month 9	36 months	D2.7
Project title	Participatory mapping of multidimensional values of vulnerability in local communities			Related to WP	WP2
Objectives: <b>ESR4 will co-develop a method for mapping social and cultural values, structures and safety nets determining vulnerability to (or resilience against) flooding at neighbourhood scale.</b> In doing so, we increase capability for developing local community risk reduction actions. To do this, it is essential that social and cultural dimensions of living with floods are included during planning. This is achieved by: (1) using participatory mapping techniques (PGIS, PPGIS) to bring community values and practices into a map during and in between flood seasons; (2) developing spatial models of community values, transitions, and tradeoffs; (3) co-designing risk reduction plans in cooperation with local communities and administration, Red Cross, and other relevant risk reduction actors in Dar es Salaam.					

REVOLUTION – ETN

Expected results: (1) PGIS data depicting spatial patterns of local values and practices of vulnerability; (2) Neighborhood and municipality scale models of communities' social and cultural value transfer in flooded and non-flooded time periods; (3) Local level risk reduction plans for selected municipalities containing sensitisation to local communities capacities and coping strategies					
Planned secondment(s): (1) RC (M16-18) to identify and co-design risk reduction plans; (2) ARU (M13-14 & 34-36) to map community values and practices and to co-design local level risk reduction plans					
Risk management: Participatory mapping methods need experienced facilitators and identification of clear community benefits and users of the data. Through engagement of the communities, risk management actors and local university experts and students, these risks can be minimised					
Enrolment in doctoral degree: UTU					
Fellow	Host institution	PhD enrolment	Start date	Duration	Deliverables
ESR 5	RC	Y (DUT)	Month 9	36 months	D2.8
Project title	Real-time flood risk forecasting for forecast-based humanitarian action			Related to WP	WP2
Objectives: <b>ESR5 will co-develop a real-time forecast of potential flood risk in Dar es Salaam.</b> The effectiveness of the forecasts for use in disaster planning is evaluated to assess whether it can lead to changed and improved decision making. This will take place with critical end users such as the Red Cross, transport agencies, emergency response agencies of the Dar Multi-Agency Emergency Response Team, the National Disaster Management Department and several ministry representatives. This is achieved by: (1) assessing currently existing operating procedures and decision making processes, and information uses with stakeholders; (2) establishing impact forecast requirements and options from the perspective of different end users, taking into account the monitoring and modelling capabilities currently available through the TURP program; (3) piloting a flood early warning dashboard based on the monitoring and modelling capabilities; (4) assessing how standard operating procedures, decision making processes and implementation of these decisions change on the basis of the pilot early warning system; and (5) establishing a scientifically grounded cost-benefit analysis to assess if benefit-cost ratios suggest that the forecasts add value to currently existing procedures.					
Expected results: (1) Pilot Early Warning system; (2) Approach to map out procedures and effectiveness of early actions for targeted stakeholders; (3) Understanding of costs and benefits related to new data and early warning information versus costs and benefits of actions taken					
Planned secondment(s): (1) DUT (M17-20) to carry out flood mapping and data integration; (2) JRC (M23-26) to develop warning thresholds & accuracy metrics. Given proximity of host (RC) to DUT (<30 min.), ESR can spend 1 day per week at DUT when necessary					
Risk management: Stakeholder collaboration can be time-consuming and slow. In case of unexpected stakeholder responsiveness, ESR will collaborate with ongoing projects in Nairobi and Mombasa to test tools and create a comparative analysis with Dar es Salaam					
Enrolment in doctoral degree: DUT					
Fellow	Host institution	PhD enrolment	Start date	Duration	Deliverables
ESR 6	ALU-FR	Y (ALU-FR)	Month 9	36 months	D3.4
Project title	Incorporating groundwater in drought risk assessment			Related to WP	WP3
Objectives: <b>ESR 6 will co-develop methods for the integration of groundwater into drought assessment using large-scale modelling with adaptive data assimilation.</b> This will lead to more integrated drought risk monitoring, since current groundwater-related indicators typically lack this critical information. This will be achieved by: (1) developing a gradient-based groundwater model at EU scale (by adapting and building on previously applied global and national scale models) to simulate groundwater heads and fluctuations; (2) using this benchmark model to develop a regionalisation and bias-correction approach that assimilates near real-time sparse groundwater level observations from key boreholes, satellite-based estimates of groundwater fluctuations (e.g. GRACE), satellite-based water demand estimates related to groundwater use, and potentially other data sources to generate an indicator for the groundwater status during drought; (3) assessing the value of such groundwater drought information at EU-level through prototype implementation into the European Drought Observatory (EDO); and (4) evaluating with stakeholders the usefulness of the approach for drought management in the Júcar river basin.					
Expected results: (1) Risk assessment method integrating groundwater model with observations and satellite data; (2) Understanding of potential of multi-data integration for drought monitoring in data-scarce conditions; (3) Basis for informing groundwater management options during droughts across Europe and Júcar					
Planned secondment(s): (1) UKRI (M12-16) to obtain groundwater observations of the European Groundwater Drought Initiative and develop modelling approach; (2) JRC (M13 & 24-27) to combine observations with satellite data and implement result in EDO					
Risk management: A main risk is the potential lack of sufficient real-time groundwater data at EU-level. This risk is mitigated by collaborating with the EU-level initiatives on groundwater data collection					
Enrolment in doctoral degree: ALU-FR					
Fellow	Host institution	PhD enrolment	Start date	Duration	Deliverables
ESR 7	UU	Y (UU)	Month 9	36 months	D3.5
Project title	Socio-hydrological modelling of groundwater use to improve drought risk management			Related to WP	WP3
Objectives: <b>ESR7 will co-develop methods to improve regional scale groundwater management, by modelling the dynamics of groundwater versus surface water use generated by feedbacks between social, technical and hydrological processes.</b> This will lead to better drought risk assessment in areas where a coordinated (i.e. conjunctive) use of both resources can reduce the harmful effects of droughts. This will be achieved by: (1) obtaining information on groundwater versus surface water use behaviour through satellite-based water balances, qualitative data collection (interviews, focus groups) and groundwater level observations; (2) developing socio-hydrological model to improve understanding of interlinkages and feedbacks between drought and groundwater use and benchmarking results against historical drought events; and (3) identifying and analysing strategies of groundwater management during drought conditions at river basin scale. The framework will be used with CHJ to examine the effectiveness of a portfolio of drought risk reduction measures in the Júcar basin.					
Expected results: (1) Innovative method for integrating quantitative and qualitative data on surface versus groundwater use; (2) Socio-hydrological model of feedbacks between drought and groundwater use; (3) Scenario analysis tool for groundwater abstraction during droughts to support updated Drought Management Plan and groundwater-related interventions following from the EU Water Framework Directive					
Planned secondment(s): VUA (M15-19) to design sociohydrological modelling framework; CHJ (M22-24 & 36-37) to obtain information on groundwater abstraction, restrictions, water use behaviour, and to implement the result in the River Basin Management Plan					
Risk management: The main risk is that the inclusion of variables in the socio-hydrological model may have little explanatory value. To mitigate this, we will test with historic data and implemented interventions in an early stage of the work					
Enrolment in doctoral degree: UU					
Fellow	Host institution	PhD enrolment	Start date	Duration	Deliverables
ESR 8	FW	Y (ALU-FR)	Month 9	36 months	D3.6
Project title	Assessing socioeconomic drought risk through novel impact functions			Related to WP	WP3
Objectives: <b>ESR 8 will co-develop a method to assess socioeconomic drought risk by developing impact functions that use machine learning methods to integrate quantitative and qualitative reported data.</b> This can be used to monitor drought risk using functions that integrate socioeconomic consequences of drought, often not included in monitoring tools. This will be achieved by: (1) developing an automatic classification technique for historic impact data (quantitative data from reported statistics and satellite-based data complemented with qualitative coded text reports and articles), building on experience with the European Drought Impact report Inventory (EDII); (2) developing machine learning-based models to assess socio-economic drought risks; and (3) testing the prototype for decision making within monitoring systems such as the European Drought Observatory, InfoSequia, and the new Alpine Drought Observatory.					
Expected results: (1) Probabilistic models linking drought indices monitored to drought impacts (impact functions); (2) A scalable automatic impact classification technique integrating quantitative and qualitative information on socioeconomic drought impacts; (3) Prototype integration of new impact functions into one of the operational monitoring systems					
Planned secondments: (1) ALU-FR (M13-M17) to build on experience with the European Drought Impact report Inventory; (2) JRC (M24-M27) to target impact function system to existing monitoring needs					

REVOLUTION – ETN

Risk management: Socio-economic drought risk classification could prove too complex due to the multi-causality of impacts. In this case, there is flexibility in using either quantitative socio-economic data (reported statistics) and/or qualitative or descriptive reports on drought impacts					
Enrolment in doctoral degree: ALU-FR					
Fellow	Host institution	PhD enrolment	Start date	Duration	Deliverables
ESR 9	VUA	Y (VUA)	Month 9	36 months	D3.7
Project title	Social media for early warning of drought events			Related to WP	WP3
Objectives: <b>ESR9 will co-develop new algorithms to harvest drought-related information from social media sources (e.g. Twitter) for early warning of drought events.</b> This will yield a tool that monitors where drought risks are mostly felt by society in Europe, and will be further tested and enhanced for the Júcar. This is achieved by: (1) developing algorithms to extract and geolocate drought-related information from online media feeds (e.g. Twitter), building on the existing TAGGS algorithms developed by VUA and FTags for flood detection using Twitter data; (2) using the new algorithm to detect and map droughts at European scale, for inclusion in EDO; and (3) enhancing the method for basin scale drought monitoring, using the Júcar river basin as case study, by including information from more regional hydrological drought monitoring systems based on satellite information ( <a href="http://www.infosequia.eu">www.infosequia.eu</a> ).					
Expected results: (1) Tool for monitoring drought risk using social media data; (2) New algorithms for deriving spatial drought indices from social media data; (3) Improved drought impact monitoring at European scale for EDO and investigation of application to Júcar river basin					
Planned secondment(s): VUA (M11-12 & 27-29): to develop indicators relevant to drought risk monitoring from online media data; FW (M17-21): to include information from the Júcar river basin					
Risk management: Social media could prove sparse for training the algorithm in some locations. Therefore, we will initially focus on the most drought-prone European regions, including the Júcar River Basin					
Enrolment in doctoral degree: VUA					
Fellow	Host institution	PhD enrolment	Start date	Duration	Deliverables
ESR 10	FW	Y (VUA)	Month 9	36 months	D3.8
Project title	Improving risk-based seasonal drought forecasts			Related to WP	WP3
Objectives: <b>ESR10 will co-develop a tool for improved seasonal probabilistic risk-based drought forecasts, by using machine-learning approaches that combine empirical forecasts with dynamic climate model-based information.</b> This tool should allow for evaluating drought risks several months ahead and thus enable mitigation actions to be taken. This is achieved by: (1) using machine learning methods to derive empirical seasonal forecast methods based on large-scale climate variability patterns (e.g. observed NAO); (2) combining these with seasonal forecasts from the new Copernicus climate service portal C3S (e.g. forecasted NAO); (3) relating these with data on actual drought impacts (e.g. yield anomalies or groundwater overexploitation indices) at the basin-scale (Júcar) and European scale; and (4) evaluating how these methods can be integrated into management decisions.					
Expected results: (1) Probabilistic risk-based seasonal drought forecast tool; (2) Improved drought forecasting method that is ready to be implemented in a drought early warning system; (3) Drought forecasts with impact indicators relevant for targeted stakeholders					
Planned secondment(s): VUA (M11-12 & 27-29) to work on machine learning methods and analysis of results & BSC-CNS (M17-21) to unite machine learning methods with operational seasonal forecast from Copernicus					
Risk management: Risk of poor performance of the forecasting systems will be mitigated by implementing a flexible approach that puts weight to either the empirical or dynamic source of information, depending on location and lead-time					
Enrolment in doctoral degree: VUA					
Fellow	Host institution	PhD enrolment	Start date	Duration	Deliverables
ESR 11	VUA	Y (VUA)	Month 9	36 months	D4.4
Project title	Comprehensive global flood mapping			Related to WP	WP4
Objectives: <b>ESR 11 will co-develop comprehensive global flood hazard maps by using novel machine learning and data assimilation methods to combine multi-source data from hydrological models, satellites, and online media.</b> These will be used to inform global flood risk assessments for UN activities through the GRAF. This is achieved by: (1) developing machine learning and data assimilation algorithms that merge data from the GLOFRIS/Cama-Flood models, satellites, and online media; (2) applying these algorithms to develop flood hazard maps for several case studies and benchmarking against observed flood extents; and (3) scaling to the globe and using them to assess global flood risk in the existing GLOFRIS model.					
Expected results: (1) Comprehensive global flood maps; (2) New methods and algorithms for combining data from global flood models, satellite data, and online media; (3) New estimates of global flood risk for assessment and monitoring activities of the UN, through its GRAF platform					
Planned secondment(s): (1) C2S (M15-18) to analyse satellite imagery and develop machine learning algorithms; (2) FTags (M21-24) to analyse online media content. Given proximity of host to FTags (~30 mins.), the ESR can spend 1 day per week at FTags as necessary					
Risk management: Gaining access to global datasets can be time-consuming, but consortium can provide immediate access to all of them. Large computing resources required are already in place through Supercomputing facilities of Surfsara via VUA. GRAF contact secured by UNDRR partner involvement					
Enrolment in doctoral degree: VUA					
Fellow	Host institution	PhD enrolment	Start date	Duration	Deliverables
ESR 12	DLR	Y (UTU)	Month 9	36 months	D4.5
Project title	Flood depth estimation from fusion of DEM and radar imagery			Related to WP	WP4
Objectives: <b>ESR 12 will co-develop a highly accurate, quick, and easy to use tool for estimating flood depths by fusing digital elevation models (DEMs) and radar imagery data.</b> This allows us to greatly improve the mapping of hazard and risk in urban areas, which are notoriously difficult to simulate with global models. The results will be used to improve global assessments of flood risk and monitoring for UN activities through the GRAF. This will be achieved by: (1) developing a method that combines radar imagery with precise DEMs from satellite (e.g. TanDEM-X), LiDAR, or drone data; (2) applying the method to several case studies and benchmarking the results against traditional in situ measurements; and (3) comparing the results against those from hydrological models, and testing their use in the existing GLOFRIS global flood risk model.					
Expected results: (1) Flood depth maps for test cases; (2) Novel methodology for flood depth estimation, including qualitative and quantitative accuracy assessment for different case studies; (3) Improved risk assessments for global risk analyses to support UN monitoring activities through its GRAF platform					
Planned secondment(s): (1) UTU (M11-15) to develop and analyse hydrological models for benchmarking; (2) DUT (M20-23) to combine radar with terrain indicators such as HAND and perform local validation using in-situ ground and UAV observations					
Risk management: In some cases, it is not feasible to gather precise in situ measurements of flood depths for validation.. To overcome this issue, proxy information will be derived from pictures and/or videos of events. GRAF contact secured by UNDRR partner involvement					
Enrolment in doctoral degree: UTU					
Fellow	Host institution	PhD enrolment	Start date	Duration	Deliverables
ESR 13	DUT	Y (DUT)	Month 9	36 months	D4.6
Project title	Detecting human-made flood protection structures through machine learning			Related to WP	WP4
Objectives: <b>ESR 13 will co-develop a method for detecting human-made flood protection structures by using multi-platform, multi-sensor aerial imagery combined with Machine Learning techniques.</b> This opens the window to developing a spatially explicit global database of dikes and levees, which would revolutionise our ability to simulate floods globally. The lack of such a database is regularly lamented in high-level policy dialogues. <b>This will be achieved by:</b> (1) developing a Bayesian network algorithm that estimates the presence of human-made structures through machine learning techniques (e.g. linear feature detection using convolutional neural networks) and proximity indicators (e.g. proximity to flat terrain, water bodies); (2) testing its applicability at different scales by performing Bayesian belief probability estimation; (3) establishing a height estimate using either radar interferometry or multi-temporal optical (photometric stereo); and (4) applying the algorithms on two diverse regions with different dike characteristics. Once developed, the ESR will integrate the data into GLOFRIS to assess how this can be used to design sustainable solutions.					

## REVOLUTION – ETN

Expected results: (1) High-resolution maps of flood protection structures in two test areas; (2) Method to detect human-made flood protection at any location and insight in usefulness of multi-sensors in detecting human-made structures; (3) Information on dike locations and characteristics that can be used as direct input to models and studies of the benefits and costs of DRR through infrastructural measures, for example for International Financial Institutions					
Planned secondment(s): (1) DRES (M17-20): scaling of machine learning techniques on Google Earth Engine; (2) DLR (M24-28): application across several satellite platforms. Given proximity of the host to DRES (<5 mins.), the ESR can spend time at DRES as needed					
Risk management: Computational resources and data storage requirements are large. To overcome this issue, we will work with partner DLR, who has these resources from the very start, and prepare a data management plan based upon an inventory of DLR's and DUT's resources					
Enrolment in doctoral degree: DUT					
Fellow	Host institution	PhD enrolment	Start date	Duration	Deliverables
ESR 14	DLR	Y (VUA)	Month 9	36 months	D4.7
Project title	Improved exposure characterisation of buildings using machine learning			Related to WP	WP4
Objectives: <b>ESR 14 will co-develop a method to accurately and reliably characterise building types, use, and height, by using machine learning methods in combination with novel very high resolution (VHR) imagery from sources such as 360° cameras, drones, and satellites.</b> These data will allow for improved representation of exposure in global flood risk models that inform international assessment and monitoring, for example through UN GRAF activities. <b>This will be achieved by:</b> (1) developing a novel method that exploits very high spatial resolution (VHR) drone/satellite imagery to automatically estimate building height using machine learning algorithms; (2) developing a method that extracts building use and type from ground-based 360° camera imagery combined with VHR satellite/drone data using deep learning algorithms; and (3) applying the method to several case studies and benchmarking the results against in-situ information. Once developed, the ESR will integrate the new data into GLOFRIS to examine how this can be used in the design of sustainable solutions.					
Expected results: (1) Maps of building characteristics for test cases; (2) Novel methods to automatically extract building type, use, and height, including qualitative and quantitative accuracy assessment for the test cases; (3) Improved large scale risk estimates to inform global assessments and monitoring					
Planned secondment(s): (1) VUA (M11-12 & 26-28) to determine characteristics and indicators relevant to global risk analysis and integrate results in GLOFRIS; (2) NASA (M15-18) to develop machine learning algorithms for deriving characteristics from satellite imagery					
Risk management: Applying deep learning for automatically characterising use and type of buildings by exploiting open image databases is a challenge. The employment of crowd-sourcing image labelling in combination with advanced transfer learning will allow us to overcome this issue					
Enrolment in doctoral degree: VUA					
Fellow	Host institution	PhD enrolment	Start date	Duration	Deliverables
ESR 15	UTU	Y (UTU)	Month 9	36 months	D4.8
Project title	Integrated flood vulnerability mapping with local spatial knowledge, earth observation data and deep learning algorithms			Related to WP	WP4
Objectives: <b>ESR 15 will co-develop integrated flood vulnerability mapping methods using a combination of local spatial knowledge, multi-resolution imagery and deep learning algorithms.</b> These data will allow for improved representation of vulnerability in global flood risk models that inform international assessment and monitoring, for example through UN GRAF activities. This is essential, as absence of realistic vulnerability estimates is a serious knowledge gap in risk models. This will be achieved by: (1) developing and testing value of participatory (PGIS) and volunteered (VGIS) data to capture contextual local flood vulnerability patterns in built environments (training data, identification of contextual proxies); (2) developing integrated models to link local knowledge with multi-source and multi-resolution imagery and deep learning algorithms; (3) applying the methods and validating the results in several case studies at broader scales. Once developed, the ESR will integrate the data into GLOFRIS to assess how this can be used to design sustainable solutions.					
<b>Expected results:</b> (1) Flood vulnerability contextual maps; (2) Integrated methods and algorithms for combining PGIS/VGIS data, imagery, and machine learning algorithms for assessing vulnerability at large scale; (3) Improved large scale risk estimates to inform global assessments and monitoring					
Planned secondment(s): (1) KCL (M12-14) to design proxies from VGIS/PGIS data; (2) NASA (M15-18) to develop methods for the integration of contextual data with image data sets and deep learning methods					
Risk management: Capturing contextual differences in vulnerability needs sufficient amount of both training and validation data from local areas. We will scale up data collection campaigns by using hundreds of volunteered local university students, who have been trained to work with community mapping methods					
Enrolment in doctoral degree: UTU					

### 3.2 Appropriateness of the management structures and procedures

#### 3.2.1 Network organisation and management structure

The success of REVOLUTION will depend to a large extent on the management of the project and the structure and procedures to enable this. The Coordinator is Prof. Philip Ward (VUA). He has coordinated a large number (~30) of national and international collaborative research projects and/or work packages, including projects funded by scientific funding bodies (e.g. Netherlands Organisation for Scientific Research; H2020 – IMPREX; FP7 - Earth2Observe), and non-scientific institutions (e.g. World Bank, UN, Dutch Ministries, World Resources Institute). He is currently member of the Management Committee of EU COST Action DAMCOLES and is appointed by the United Nations as member of the Expert Group of UNDRR's Global Risk Assessment Framework. In 2019 he received the European Geosciences Union **Plinius Medal**, a prestigious award recognising **outstanding research achievements in fields related with natural hazards**, specifically with DRR applications.

VUA is highly experienced at coordinating and managing EU training networks and research training projects, including Marie Skłodowska-Curie ITNs (Section 5.1) and summer schools, is member of the Climate-KIC training network, and hosts the director of the SENSE research school - a joint venture of Dutch universities for interdisciplinary PhD training on sustainability. VUA has an extensive set of structures and procedures to ensure the successful management and delivery of the training programme, scientific quality of the research, and effective dissemination and communication. Overall management and coordination are carried out in WP7. A schematic overview of the management structure is presented in Fig. 3.2a. Three levels of management are distinguished: (1) day-to-day management; (2) decision making; and (3) advice and monitoring. Day-to-day management is the responsibility of the Project Office at the Coordinating Institute and the Executive Board at Consortium level. During ESR recruitment (M1-8), a Recruitment Committee will coordinate the ESR recruitment process (Section 3.2.3). The Supervisory Board (SB) is the decision-making body of REVOLUTION. Internal advice and monitoring are provided by the SB, whilst external advice and monitoring is provided by the Advisory Board.

**Coordinating Institute and Project Office:** VUA employs a dedicated Project Office (PO) consisting of the Coordinator, a dedicated Project Manager (PM) (financed via ETN, costs category ‘management and overheads’), and a project support office. Under responsibility of the Coordinator, the PM will execute **all daily administrative, legal and financial issues** concerning the whole project and will be in direct contact with representatives of the European Commission (EC). The Coordinator and PM are assisted by the project support team, including a financial controller and secretary. The financial controller assists in monitoring the budget and financial reporting to the EC and is available to consortium partners for financial/budget questions. Together, the PO ensures financial management and distribution of budget as agreed in the Consortium Agreement. Furthermore, the PO has dedicated service units to provide expert legal, administrative, and financial advice and support, including: a Technology Transfer Office, the Grants Desk, and the Project Control and Administration Office.

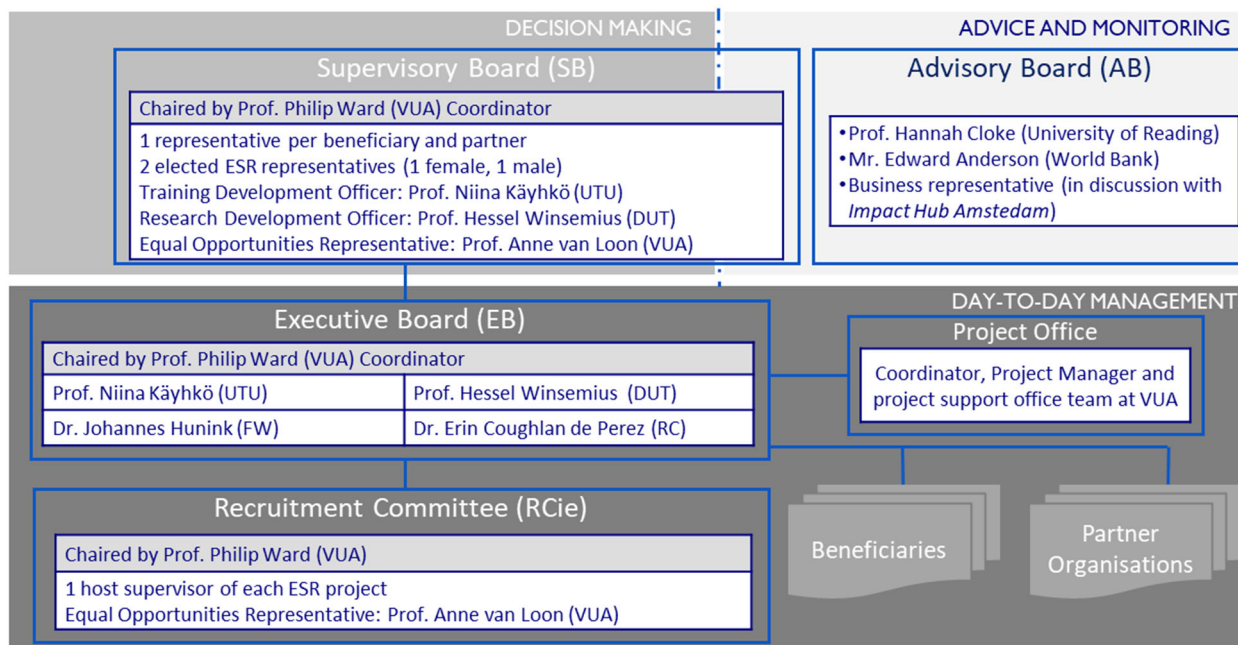


Figure 3.2a: Overview of management structure

**Executive Board (EB):** The EB consists of the WP leaders and is chaired by the Coordinator. Each WP leader coordinates the work performed in her/his WP, and reports to the Coordinator. The EB acts as the **central management team** of REVOLUTION. Specific tasks include: preparation and organisation of management meetings; drafting reports and associated documents and forms for the EC; monitoring inter-WP alignment; and progress of activities and deliverables, based on the defined milestones and means of verification. In case contingencies occur, the EB will advise the Supervisory Board (SB) on any corrective measures. The EB will meet at least bi-monthly. Most meetings will be telephone/video conferences, with in person meetings during the start-up and kick-off meetings, milestone training events, and final conference. The in-person meetings precede the in-person SB meetings. Additional meetings can be convened upon written request by any EB member to the chair.

**Supervisory Board:** see Section 3.2.2.

**Advisory Board (AB):** An AB will be appointed to provide regular **external expert advice** on the quality of the deliverables and suggest corrective measures if necessary. The AB has no formal decision power and the AB members are independent. The AB includes representatives from science, policy and decision-making, and business. The science member is **Prof. Hannah Cloke**, Professor of Hydrology at University of Reading. She has vast experience in research and PhD training related to flood and drought risk across scales, and holds the prestigious Plinius Medal for her outstanding interdisciplinary research in natural hazards. The policy and decision-making member is **Mr. Edward Anderson**, Senior Digital Development and Resilience Specialist at the World Bank. He has over 15 years of experience linking the application of new technologies to development practice. A **business representative** will be appointed in discussion with *Impact Hub Amsterdam*, if the proposal is retained for funding – several candidates have been identified already and expressed their willingness to participate.

**Communication and project meetings:** To be effective as a large collaborative network, sound internal communication is essential. The REVOLUTION website will include a collaborative working platform to provide the appropriate tools for exchanging and archiving information internally in an effective and user-friendly way. The network will meet periodically both face-to-face as well as through telephone/video conferencing, to discuss matters and exchange information in depth; these meetings are summarised below.



Table 3.2a: Overview of REVOLUTION meetings and their characteristics

Body	Frequency	Prep	Method and scope
Supervisory Board	M9,14,25,36,45	EB	Face-to-face; formal accord on progress reporting to EC, decisions affecting Consortium Agreement and/or EC contract, dissemination and exploitation, dispute resolution.
Executive Board	Bi-monthly	Coordinator	Face-to-face & teleconference; research and training coordination, overall progress of WPs towards objectives, inter-WP alignment, scientific discussions, reporting to SB.
All	M9,14,25,36,45	EB	Face-to-face meetings (during kick-off, milestone training events, and final conference); exchange of scientific data with focus on ESRs and sharing information between WPs.
WP Teams	Frequent	WP leaders	Face-to-face & teleconference; WP progress, intra-WP alignment.
Recruitment Committee	M1,2,3,5	RCie members	Teleconference; coordination of recruitment procedure; eligibility check during pre-screening of applications; approval of final ESR selection.

### 3.2.2 Supervisory board (SB)

The SB is chaired by the Coordinator and consists of 1 representative per beneficiary and partner organisation, 2 elected ESR representatives (1 female, 1 male), and the REVOLUTION Equal Opportunities Representative, Prof. Anne van Loon (F) (Section 3.2.7). A Training Development Officer (Prof. Niina Käyhko) and Research Development Officer (Prof. Hessel Winsemius) will ensure consistency in training and research quality. The SB will meet in-person at the kick-off meeting, milestone training events, and final conference. Video/teleconferencing facilities will be organised to allow participation of any SB member unable to attend in person. Extraordinary meetings can be convened upon written request by any SB member to the Coordinator. The primary responsibility of the SB is to **oversee the quality** of the programme and **review the progress** of all aspects of REVOLUTION.

The SB is the **internal advisory body** for contingencies, disruptions, or disputes, and is responsible for adjusting the work plan if necessary. The SB will formulate a strategy on **scientific misconduct**, detailing notification, confidentiality, and assessment of any allegation of misconduct as well as consequences for researchers and institutions. This will be discussed with ESRs during a research integrity course at the kick-off meeting. The consortium will abide by the European Code of Conduct for Research Integrity.

In addition, the SB has specific **decision-making responsibilities** in the allocation of financial resources, formal accord on progress reporting to the EC, and any decisions affecting the Consortium Agreement and/or EC contract. In principle, decisions are made by consensus. If no consensus can be reached, decisions will be made by simple majority vote. Each SB member has one vote, and in case of split decisions the Coordinator has the casting vote.

### 3.2.3 Recruitment strategy

The recruitment strategy will strictly follow the European Charter for Researchers and Code of Conduct for the Recruitment of Researchers. In participating organisations where a PhD requires 4-years, measures have already been discussed to source funding from other projects or internal funding to cover the extra year. In some organisations, 4-years is the norm, yet not compulsory (e.g. in the Netherlands) – in this case, measures are in place to allow for PhD completion in 3 years (e.g. no involvement in teaching and stipulating that the candidate must hold a Master’s degree with a strong research component). An initial recruitment round will aim to have all ESR contracts signed by M6 (MS3, Table 3.1c), thus leaving time for a second round if required (until M8; D7.3; Table 3.1b). This ensures that all ESRs can take part in the kick-off meeting (M9) and all training events. To ensure that the process guarantees global access and a fair, efficient, transparent and competitive selection of ESRs, and to assure gender equality, the process will be coordinated by a Recruitment Committee (RCie). The RCie includes one of the host supervisors of each ESR, the Training Development Officer, plus the Equal Opportunities Representative. The RCie consists of members from both academic and non-academic sectors, and a variety of disciplines and countries. The RCie has a good gender balance, 40% female and 60% male. The recruitment process will be organised as follows:

**Announcement of positions:** Advertisements will be published in various recruitment databases of international scientific journals and organisations; internet portals including the EC jobs portal (<http://ec.europa.eu/euraxess>) and Academic Jobs EU portal (<http://www.academicjobseu.com/>); the REVOLUTION website; presentations and networking at relevant meetings and conferences (e.g. EGU); and REVOLUTION beneficiaries and partners own websites. For each ESR position, there will be a designated contact person at the host beneficiary. She/he responds to informal enquiries and is responsible for further promoting the post through appropriate professional networks.

Advertisements will include:

- Description of knowledge, skills, and competencies required, including requirements of holding Master’s degree and evidence of competence in English. It will be made clear that candidates will work in transdisciplinary science;
- Description of working conditions and entitlements - all ESRs receive employment contract and social coverage;
- Career development prospects related to the programme and its benefits to the researchers;
- A description of the recruitment process.

**Pre-selection of candidates:** Candidates will apply for a specific ESR project by submitting their CV, motivation letter, 2 letters of reference, and academic credentials. The RCie will check the eligibility of candidates using a

standardised form with checklist developed by the RCie, with input from the Human Resources Department of VUA. All eligible applications will be made available to the ESR Supervisory Teams.

**Final selection:** After the pre-selection phase, interviews will be undertaken at the host beneficiaries. All interview appointments will be communicated to the RCie in advance. Interviews will be conducted by (at least) the ESR Supervisory Team and a PhD student / junior researcher at the host beneficiary. Interviews will include a presentation of recent research of the candidate and their vision/ideas for addressing the ESR project. Following the interviews, a ranking and shortlist will be forwarded to the SB, who will approve the selection of each ESR. This will allow for monitoring of a good overall gender balance. Candidates will be selected based on their scientific background and potential as indicated by their education, experience and Master’s thesis; motivation and expected benefit to the project as described in the letter and interview; and in accordance to gender equality and minority rights. Special requirements for an acceptable work/family life balance will be taken into account.

### 3.2.4 Progress monitoring and evaluation of individual projects

To monitor and evaluate the progress of each ESR project, the following procedures will be in place:

**Supervision welcome meeting:** held in the first week of employment, between the ESR and her/his Supervisory Team. Objectives are to: make the ESR feel welcome and safe at the host beneficiary and part of the REVOLUTION team; explain the ESR expectations and relevant REVOLUTION formalities; decide upon the appropriate supervision approach; and introduce the ESR to the Personal Career Development Plan (PCDP).

**PCDP:** Each ESR will write a PCDP, which includes a detailed supervision plan, training plan, dissemination plan, and PhD outline (problem statement, aims and objectives, methods, expected results, milestones, dissemination and exploitation plan). A template will be developed by the EB, coordinated by the Training Development Officer. PCDPs will be submitted for internal review in M12. Each PCDP will be reviewed by 2 experienced researchers from beneficiaries/partner organisations not involved in the Supervisory Team of the ESR. Final versions of the PCDP will be approved by the SB in M14. The PCDP forms the basis for the monitoring and evaluation of progress.

**Supervision meetings:** Informal monthly progress meetings between ESR and ESR Supervisory Teams. These take place at the host beneficiary, or at secondment institutions during secondments, with video conferencing facilities to enable attendance of all members of the Supervisory Team. These meetings aim to provide scientific discussion and advice throughout the project, and to monitor progress on a regular basis to ensure that delays are minimised.

**Formal evaluation meetings:** Two formal evaluation meetings will be held per year between ESR and ESR Supervisory Teams. ESR progress will be appraised against the PCDP, and where appropriate this will be adapted. Based on these meetings, the main supervisor will submit a half-yearly written progress report to the EB. A standard format for these progress updates will be developed by the EB.

**Progress monitoring at consortium level:** At consortium level, progress on individual projects is monitored by the EB, using the half-yearly written progress reports described above. The ESRs will report in written form and in presentation form to the REVOLUTION community, the SB, and the AB, during the consortium meetings.

### 3.2.5 Risk management at consortium level

The consortium has profound experience in collaborative research and training projects, and all beneficiaries and partners have their own risk management procedures. Examples of types of risks specific to implementation of REVOLUTION are summarised in Table 3.2b, together with mitigation measures. Risks and mitigation measures specifically related to achieving the envisaged impacts (including exploitation) are described in Section 2.5. The management and monitoring procedures described in Sections 3.2.1, 3.2.2, and 3.2.4 ensure that problems can be identified early, and rectified at the appropriate level. In REVOLUTION, we take a bottom-up hierarchical approach to risk mitigation and eventual problem/conflict resolution, using the hierarchy of ESR Supervisory Team → WP → SB. The hierarchical level at which an emergent risk, problem, or conflict arises will have the responsibility to solve it. Only when this is not successful, will it be transferred to the next higher level.

Table 3.2b: Implementation risk

Risk No.	Description of risk	WP no.	Proposed mitigation measures
R1	ESR recruitment risks: e.g. delay in ESR recruitment or ESR terminates contract.	2-4	A structured, efficient recruitment process managed by a dedicated Recruitment Committee (Section 3.2.3) reduces risk of delayed recruitment. Moreover, initial and second rounds of recruitment are planned, ensuring adequate time to have all ESRs started by the kick-off (M9). RCie will begin developing advertisement texts and procedures prior to official project start date. ESR Supervisory Teams all experienced in mentoring young researchers, and structured supervision framework and monitoring allows us to detect problems early and offer remedial support, thereby reducing risk of contract termination. All ESR projects designed to avoid critical dependence between projects.
R2	Supervision risks: e.g. ESR supervisor terminates contract.	2-4	Each ESR has a Supervisory Team, including 2 supervisors at host beneficiary, so that supervision continues in the event of 1 supervisor leaving project. Moreover, beneficiaries and partners have experienced staff who can quickly take over supervisory roles in this eventuality.
R3	Consortium-composition changes and risks: e.g.	1-7	Key staff (e.g. WP leads) have been selected for expertise in specific elements and complementary skill-sets. Nevertheless, the consortium includes other expert staff members with similar skills who are willing to take over

## REVOLUTION – ETN

	WP lead terminates contract.		key roles. All beneficiaries and partners experienced in multi-year projects and have their own strategies in place to mitigate risks of staff changes.
R4	Consortium composition: partner offering secondment withdraws	2-4	The ESR Supervisory Team, in collaboration with the Executive Board and Training Development Officer, look for an alternative that fits well the nature of the ESR. Approval by Supervisory Board.
R5	Scientific risks related to data, challenges with implementing research plan, etc.	2-4	The close supervision of ESRs in the Supervisory Teams allows for early identification of scientific risks. Experienced scientists and staff at all beneficiaries and partners will support problem solving and/or adjusting research plan. Our LL-approach, which includes local stakeholders, is designed to mitigate the risk of data availability.
R6	Scientific risks related to equipment, e.g. drone permits, or vandalism and theft.	2-3	We will collaborate with local stakeholders who already hold permits for specific equipment, e.g. drones. We mitigate the risk of vandalism and theft of instruments by using mobile equipment where possible, or installing permanent equipment on locations that are secure. Eventual replacement costs will be low as we aim to use low-cost materials and prototypes.
R7	Political risks related to Tanzania activities, e.g. civil unrest or other safety issues prevent travelling.	1,2, 5,6	Tanzania is known to be relatively politically stable, although there have been incidents of terrorism, particularly in Zanzibar. Local media and international government travel warnings will be monitored for any signs of unrest. In the unlikely event that travel is deemed unsafe, we will assess another location where community mapping is increasing to pilot our methods, particularly focusing on the open cities initiative of the World Bank.

### 3.2.6 Intellectual Property Rights (IPR)

Protection and exploitation of results receive high priority, supported by Innovation Exchange Amsterdam (IXA) at VUA. IPR will be on the agenda of all SB meetings. IPR and confidentiality issues (publications, licensing, patents, exploitation) will be addressed in the Consortium Agreement based on the DESCAs Model. Prior to the start of REVOLUTION, all beneficiaries and partners will negotiate and sign the Consortium Agreement, which considers how to treat Background (information held by beneficiaries and partners prior to accession to the Grant Agreement), the ownership of Foreground (results generated within the project) and access rights. To stimulate a smooth collaboration in the development of methods and tools between commercial and non-commercial beneficiaries and partners, the Consortium Agreement will include both research (e.g. publication and joint development) and commercial interests (staying ahead of competition, discouraging copying behaviour by commercial thirds). The consortium has much experience with this, especially through the private sector/consultancy participants (FW, FTags, C2S, ULabs, DRES, DLR) and VUA's IXA, for example through: (1) using different licenses for different modules within the software; (2) releasing model code with a time-lapse (only upon actual publication of software); (3) updates of software (that are not published) released under a different license. A detailed dissemination, exploitation, and communication plan (D5.2) will be developed in WP5, under the obligations and agreements set out in the Consortium Agreement. **As a main objective of REVOLUTION is to co-develop novel data, tools and methods for designing and assessing solutions, we expect large potential for exploitable results and IP; examples are described in Section 2.3.2.**

### 3.2.7 Gender aspects

In promoting equality between females and males in science, REVOLUTION will strictly operate according to Equal Opportunities. This will be supervised by the REVOLUTION **Equal Opportunities Representative**, Prof. Anne van Loon (F). She is Associate Professor at VUA, and has won several awards for teaching, training, and research, and is coordinator of the Panta Rhei Working Group *Drought in the Anthropocene*. Prof. Anne van Loon is ideally placed to act as role model for the ESRs; she has organised workshops on women in STEM in Switzerland, and in her previous positions initiated and chaired a working groups for female researchers. ESR Supervisory Teams will provide specific mentoring on the issues faced by female researchers in an effort to reduce the loss of women from academic careers. Our Equal Opportunities Representative will support them in this, by ensuring that the ESR Supervisory Teams make female ESRs aware of local schemes available to support female researchers. Consideration of gender aspects in terms of scientific implementation are discussed in Section 1.1.4. To lend credence to our efforts to increase equal opportunities, all beneficiaries have an active institutional equal opportunities policy and an excellent track record in this area. The coordinator, VUA, was ranked 2<sup>nd</sup> for gender equality in the *THE University Impact Ranking 2019*. Several beneficiaries have been recognised with various accolades related to gender (Athena Swan Bronze) and LGBT (Stonewall Diversity Champion) issues in the workplace.

**Involvement of female senior staff:** Two out of five (40%) WP leaders are female (WP1, Niina Käyhko; WP5, Erin Coughlan de Perez), as are the Training Development Officer and Equal Opportunities Representative. The scientists in charge are female at 40% of beneficiaries, and almost 40% of the planned members of the SB are female. Hence, the number of females in lead positions is around the target of 40% as declared in the Council Resolution on Science and Society. To further raise gender awareness, we will put emphasis on inviting female keynote speakers to all events. This substantial involvement of female scientists and professionals will encourage female ESRs to engage in the flood and drought risk research and application world, which has traditionally seen more male employees.

**Level of recruitment:** Decisions on ESR recruitment will be made on the basis of merit regardless of marital status, age, sexual preference, social class, race, religion or family circumstances. Language in advertisements will be carefully considered so as to not discriminate. All shortlisted ESR candidates will be discussed and selected by the RCie at a joint meeting, which allows monitoring of a good overall gender balance. Given the past experience of the beneficiaries in recruiting PhD candidates in fields related to REVOLUTION, we expect an equal balance between

female and male ESRs to arise naturally. We aim to have **at least 40%** of female ESRs, and this will be overseen by the RCie, which includes our Equal Opportunities Representative.

### 3.2.8 Data Management Plan

REVOLUTION will participate in the open access to research data pilot. This includes taking measures to make research data FAIR (findable, accessible, interoperable, and re-usable). The consortium will ensure **free and open access** to all scientific publications relating to its results. At a minimum, they will be available by archiving in a repository at the time of publication ('green' model). A **Data Management Plan (DMP)** will be prepared by M5 (D7.2), and updated during the project by the EB, subject to approval by the SB. At least the points will be addressed:

**Data set description:** We will at least collect/generate: **geographical data** as digital maps – these can be raw data that we collect or use from secondary sources (e.g. satellites, radar); processed data that we generate from the raw data (e.g. maps of levees, building heights, Digital Elevation Models) or output of models (e.g. flood and drought risk maps); **observations** of states of physical systems, such as river levels, groundwater levels; raw and processed data from **online media**; qualitative and quantitative data from **citizen science** approaches and **interviewing**.

**Standards:** to increase interoperability and re-use, the DMP will use existing standards for different datasets. For example, for computer simulations NetCDF files following CF conventions are preferred, since they are platform independent and meta-data are self-contained. For GIS analyses, GeoTIFFs with appropriate metadata are preferred for raster data, and geoJSON/Shapefiles for vector data. Version control and metadata standards will be described.

**Data sharing:** the leading principle of REVOLUTION in providing open access to research data is “*as open as possible, as restricted as necessary*”. This will be facilitated by the use of Creative Commons licences. If access cannot be granted to specific parts of the research data, the DMP will clearly specify the reason.

**Archiving and preservation:** During the research, non-sensitive data will be archived within existing infrastructures of the consortium, for example all of the supercomputing facilities available to the consortium have dedicated archiving facilities. Where possible, open data will be published as an integral supplement of peer-reviewed papers. Where the journal does not have this option, open data will be stored in long term data archives, such as DANS (<https://dans.knaw.nl/en>), with an associated Digital Online Identifier (DOI). Sensitive anonymised data can be stored on secure servers with encryption, through the use of University systems.

### 3.3 Appropriateness of the infrastructure of the participating organisations

VUA's Institute for Environmental Studies (IVM) is the oldest environmental research institute in The Netherlands and one of the world's leading institutes in sustainability science. The main infrastructural requirement of the project is access to state-of-the-art computer facilities, model code, and software. All of our academic organisations, plus several of our non-academic organisations, have access to in-house high performance computing facilities (HPC) (Section 5) and support teams. Moreover, the consortium includes a dedicated supercomputing centre (BSC-CNS) and 2 aeronautics and space agencies (DLR; NASA), with huge HPC facilities, support, and experience. Given the large spatial datasets to be used in REVOLUTION, we will also use Google Earth Engine computational resources (discussed already with Google). Several consortium members are highly experienced with this platform, are integral to the Google Earth Engine community, and will provide training to the ESRs (e.g. DUT, C2S, DRES).

Key data, model code, and software required for the ESRs are also developed and housed at our consortium organisations. Selected examples are GLOFRIS at VUA; TAGGS at FTags; OpenDataKit at HOT-OSM; satellite data algorithms of FW, C2S, NASA, JRC, and DLR; hydrological data at UKRI and CHJ; and hydraulic modelling software of DRES. Our partnership with JRC gives unrivalled access to the European Drought Observatory, European Flood Awareness System, and Copernicus Emergency Management System. The success of the community mapping projects requires an active and extensive network of mappers and engagement from local communities. This is facilitated by collaboration with HOT-OSM, which maintains a permanent mapping team in Tanzania; and RC, who can mobilise communities at local level as well as local Red Cross institutions.

For training courses, appropriately equipped training labs are available, and the consortium is composed of organisations with an excellent reputation and successful experience with supervision of PhDs, proven by their previous involvement in various research and training programmes (Section 5). All participating organisations have experience in hosting international researchers and guests, and all host beneficiaries have support teams who can assist the ESRs with administrative and logistical issues. All ESRs will be encouraged to use the EURAXESS Services for relocation assistance.

### 3.4 Competences, experience and complementarity of the participating organisations and their commitment to the programme

#### 3.4.1 Consortium composition and exploitation of participating organisations' complementarities

REVOLUTION includes all types of organisations in the so-called quadruple helix of social innovation, namely: academic, private sector, non-governmental and (intra)governmental. From the academic sector, we include both universities and university-affiliated organisations (VUA, UTU, DUT, UU, ALU-FR, ARU, KCL, BSC-CNS), as

well as non-university research institutions who perform a wide range of non-academic activities in the private/policy domain (DLR, UKRI, JRC, DRES, NASA). We also include private sector companies (FW, FTags, C2S, ULabs), NGOs (RC, HOT-OSM), and governmental agencies ranging in scale from regional (CHJ) to intragovernmental (UNDRR). The SMEs involved (FW, FTags, C2S) have extensive experience in research and training, and FW has successfully coordinated WPs in several H2020 projects (e.g. IMPREX & BRIGAD). Through collaborations with their sister offices in several countries, FW can provide the ESRs with an even broader network.

We also ensure high complementarity between different expertises. These are detailed in Section 5, and Table 3.4a gives an overview of some core expertises per organisation, showing the large spread across the consortium. Our ESR supervisors include staff who are experts in a wide range of fields, including: hydrology, risk science, physical and social geography, geoinformatics, economics, social science, citizen science, engineering, water resources management, computer science, statistics, mathematics, and many more.

Table 3.4a: Complementary expertise of the partners of the REVOLUTION consortium

Expertise	VUA	UTU	DUT	FW	RC	DLR	ALU-FR	KCL	ARU	UU	FTags	C2S	ULabs	UKRI	CHJ	NASA	JRC	HOT-OSM	DRES	BSC-CNS	UNDRR		
Societal outreach					x	x		x			x	x		x	x	x	x	x	x			x	
Entrepreneurship		x		x							x	x	x										
Participatory science		x			x			x	x		x		x						x				
Citizen science	x	x	x		x			x	x										x				
Socio-hydrology	x	x								x													x
Water risk and resource management	x		x	x	x		x	x	x	x				x	x		x		x				x
Hydrological/risk modelling	x	x	x	x			x	x	x	x				x	x		x		x		x	x	
Geospatial data processing	x	x	x	x		x	x	x	x	x		x	x	x		x	x		x				
Machine learning	x		x			x					x	x				x							x
Large, new datasets & processing	x		x	x		x	x			x	x	x	x	x		x	x		x		x	x	

All of the consortium organisations have **successfully collaborated in past research and training projects** with at least one of the other REVOLUTION organisations, including several joint PhD supervisions; prominent examples can be found in Section 1.4.2. However, REVOLUTION brings them all together in a truly unique and synergetic new network of networks, which will facilitate the development of new technologies that could not be achieved in past collaborations – see Section 1.4.2. The setup of REVOLUTION ensures that we can exploit these complementarities and synergies in an effective way. Examples include: (1) teams of ESRs and organisations working together on shared aims and objectives in WP2-4; (2) ensuring that all ESRs spend secondments (and short visits) in different sectors to their host beneficiary, and in organisations with different expertise; and (3) ESR Supervisory Teams comprised of supervisors with different expertise all involved in the supervision process from start to end, i.e. co-supervisors are an integral part of the team, and their input is explicitly not limited to the secondment period.

### 3.4.2 Commitment of beneficiaries and partner organisations to the programme

All beneficiaries and partners are fully committed and have been involved fully in the proposal writing. **The commitment of partner organisations is declared in Letters of Commitment** (Section 7). The use of the LL-approach ensures a tight link between our activities and the missions of the organisations, which will ensure durable commitment, and this is further guaranteed by the fact that we specifically co-create new data, tools, and methods to address their needs, and develop innovative science to support and improve initiatives and frameworks that will exist after the lifetime of REVOLUTION, e.g. EDO and Copernicus Emergency Management Service (JRC), GRAF (UNDRR), and Ramani Huria (HOT-OSM).

Beneficiaries will recruit either 1 or 2 ESRs and provide secondments to **at least 1 ESR** (Table 1.2a). In doing so, they provide 2 supervisors for each ESR that they host, and 1 co-supervisor for each secondment ESR (Table 1.3b). Partners provide secondments (and co-supervisors) to the ESRs (Table 1.2a). An exception is UNDRR, whose formal role is in the research workshops, training, and networking, and not secondments, since this is a perfect fit to their role as international secretariat in the facilitation of disaster risk reduction. All beneficiaries and partners are able to offer the opportunity for short research visits to ESRs, where this is mutually beneficial to the ESR, organisation, and REVOLUTION. All beneficiaries **and** partners have designated a representative to the SB.

All beneficiaries and partner organisations will contribute actively to the network-wide training events (Table 1.2b). Moreover, they will all contribute to the research workshops in the WPs in which they are involved – host institutes of the research workshops are stated in Table 3.1a. Specific input of the non-academic sector in the training programme is further elaborated in Section 1.2.2. Most importantly, all beneficiaries and partner organisations are extremely excited and passionate about the possibilities that REVOLUTION could open.

## **4 EID specific requirements**

Not applicable to ETN submission

## 5 Participating Organisations

### 5.1 Beneficiaries

Beneficiary 1: Stichting VU (VUA)	
<i>General description</i>	Academic research and education at VU Amsterdam (VUA) are characterised by a high level of ambition, and encourage free and open communication and ideas. In 2018, VUA hosted ~ 25,000 students and over 2,000 scientific staff. The total research output in 2018 translated to over 7,400 scientific publications, and 430 doctoral theses. In the THE University Impact Ranking 2019, the VU was ranked 2nd for gender equality and 6th for partnerships for SDG goals. The proposed research will be coordinated by the Department of Water and Climate Risk (WCR) of the Institute for Environmental Studies (IVM). IVM is a world-leader in flood and drought risk research, and its staff have published ~15 papers in Nature or Science journals in the last 5 years on these issues. IVM is also a world-leader in sustainability science, with VUA being ranked 4 <sup>th</sup> in the Environmental Studies section of the Centre for World University Rankings. Our focus is on solution-oriented research, in which we aim to work together with leading academic and non-academic partners to achieve solutions to environmental issues. We regularly collaborate with institutes including UNDRR, OECD, World Bank, FAO, Red Cross, Dutch Ministries, the Netherlands Environmental Assessment Agency, and companies including (re)insurance companies, FutureWater, FloodTags, and Cloud to Street. IVM is involved in education and training from Bachelors to PhD level, as well as professional training.
<i>Role and commitment of key persons (incl supervisors)</i>	<b>Prof. Philip Ward</b> (M) is Full Professor in Global Water Risk Dynamics and Head of IVM's Global Water and Climate Risk department. He is at the forefront of global flood and drought risk science and training. In 2019 he was awarded the prestigious EGU Plinius Model for his outstanding interdisciplinary achievements in natural hazards research. He is visiting researcher at Columbia University. He has been granted and led ~30 research projects from national and international science agencies, (intra)government bodies, and private funding agencies. He is in the Management Committee of EU COST Action DAMOLCES and has led WPs and tasks in several EU projects, such as IMPREX, earth2Observe, and RISES-AM. He leads a 5-year Dutch VIDI project on compound flood risk; this is one of the most prestigious grants of the Dutch Research Foundation (NWO). He is appointed by the United Nations as member of the Global Risk Assessment Framework Expert Group. Prof. Ward is/has been supervisor to 16 PhDs. He is the principal REVOLUTION Coordinator, and leads WPs 4,6&7, is main supervisor of ESR11, and co-supervisor (and PhD-granting supervisor) of ESR14 (25% full time equivalent (fte) time involvement). <b>Prof. Jeroen Aerts</b> (M) is Full Professor in Risk and Water Management, and has managed projects exceeding €20 million. He is/has been supervisor to 35 PhDs. He is main supervisor of ESR9 (5% fte). <b>Prof. Anne van Loon</b> (F) is Associate Professor in drought risk, and chair of the Panta Rhei Working Group <i>Drought in the Anthropocene</i> . In 2017, she received the EGU Outstanding Early Career Scientists Award. She is/has been supervisor to 7 PhDs. She is co-supervisor of ESR7 and will act as REVOLUTION Equal Opportunities Representative (5% fte). <b>Prof. Dim Coumou</b> (M) is Associate Professor in extreme weather and climate variability. He is/has been supervisor to 9 PhDs, and has managed many international research projects. He is co-supervisor and PhD supervisor of ESR10 (5% fte). <b>Prof. Hans de Moel</b> is Assistant Professor in flood risk management and adaptation, and leads a Work Package in H2020's IMPREX project. He has extensive experience in education, and is/has been supervisor to 8 PhDs. He is supervisor of ESR9&11 (10% fte).
<i>Key research facilities, infrastructures and equipment</i>	VUA is member of the SENSE research school, meaning that ESRs will have access to their large range of courses across a large number of Dutch universities. Research infrastructure available includes state of the art computer equipment, including solutions for storing data, version management, and servers dedicated for research purposes. We collaborate with the national eScience centre and have access to the High Performing Computing facilities, expertise, and technical support of SURFsara, which is a collaborative ICT organisation for Dutch education and research.
<i>Status of research premises</i>	Research premises owned by VUA and independent from other beneficiaries and/or partners.
<i>Previous involvement in research and training programmes, including ITN</i>	In FP7, VUA acquired close to 220 grants across all pillars and priorities, among which 70 as coordinator. A total of 54 Marie Skłodowska-Curie grants were obtained out of FP7, of which 27 training networks. IVM was coordinator of several FP7 projects relevant to this grant, including ENHANCE; and has played a major role in many relevant FP7 projects, including the GREENCYCLESII and GATEWAYS ITNs, as well research projects including RISES-AM, earth2Observe, TURAS, CONHAZ, and ECONADAPT. Prof. Ward was granted the most prestigious early-career personal research grant in the Netherlands (VENI) by the Netherlands Organisation for Scientific Research (NWO) in 2010. He led an international project in Jakarta to train young scientists on flood risk assessment and management.
<i>Current involvement in research and training programmes, including ITN</i>	In Horizon 2020, VUA has acquired approximately 160 grants across all pillars and priorities, among which around 73 as coordinator. A total of 47 Marie Skłodowska-Curie grants were obtained in 2014-2019, of which 27 ITNs, including NEWAVE and COUPLED. IVM currently leads the NEWAVE ITN. IVM is currently involved in H2020 projects including IMPREX, which examines the use of forecasts in risk reduction. IVM has framework contracts related to climate change and sustainability with DG CLIMA and DG ENV (EU Water Policy), and Prof. Ward is part of the Management Committee of EU Cost Action DAMOCLES, which examines the impacts of compound extremes on society. Prof. Ward, Dr. Coumou, and Prof. Aerts have all been granted either the most prestigious mid-career (VIDI) or advanced (VICI) personal research grants in the Netherlands by (NWO). VUA's IVM is a core member of the SENSE research and graduate training school, and a member of the Climate-KIC Education programme.
<i>Submission of similar proposals under the same H2020-MSCA-ITN-2020 call</i>	Not submitted other similar proposals under the same H2020-MSCA-ITN-2020 call.
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>• <b>Aerts, J.C.J.H.</b> et al., 2018. Integrating human behaviour dynamics into flood disaster risk assessment. <i>Nat. Clim. Change</i>, 8, 193-199</li> <li>• De Bruijn, J.A., <b>De Moel, H.</b>, Jongman, B., <b>De Ruiter, M.</b>, <b>Wagemaker, J.</b>, <b>Aerts, J.C.J.H.</b>, 2019. A global database of historic and real-time flood events based on social media. <i>Nature Scientific Data</i>, 6, 311</li> <li>• <b>Veldkamp, T.I.E.</b>, <b>Aerts, J.C.J.H.</b>, <b>Ward, P.J.</b>, et al., 2017. Water scarcity hotspots travel downstream due to human interventions in the 20th and 21st century. <i>Nat. Commun.</i>, 8, 1-12</li> <li>• <b>Ward, P.J.</b>, <b>Aerts, J.C.J.H.</b>, et al., 2017. A global framework for future costs and benefits of river-flood protection in urban areas. <i>Nat. Clim. Change</i>, 7, 642-646; &amp; <i>Global Flood Analyzer</i> (<a href="http://www.wri.org/floods">www.wri.org/floods</a>)</li> <li>• <b>Ward, P.J.</b>, <b>Coughlan de Perez, E.</b>, <b>Winsemius, H.C.</b> et al., 2015. Usefulness and limitations of global flood risk models. <i>Nat. Clim. Change</i>, 5, 712-715</li> </ul>

REVOLUTION – ETN

Beneficiary 2: Turun Yliopisto (UTU)	
<i>General description</i>	The University of Turku (UTU) is an internationally competitive research-led university whose operation is based on high-level research. UTU offers study and research opportunities in seven faculties: Humanities, Science and Engineering, Medicine, Law, Social Science, Education, and Turku School of Economics; and in seven independent units: Brahea Centre of UTU, Centre of Language and Communication Studies, Finnish Centre for Astronomy with ESO, Research Unit for the Sociology of Education (RUSE), Turku Centre for Biotechnology, Turku Centre for Computing Science (TUCS), and Turku PET Centre. In the international QS ranking, UTU is among the top 300 universities in the world and is ranked third best university in Finland (QS Ranking 2019). UTU has over 20,000 students and 3,493 staff members (60% female). External funding covers 39% of the total funding of 261 million euros. The total research output in 2018 was 6024 scientific publications, 194 doctoral theses, 1805 Masters and 1688 Bachelor theses.
<i>Role and commitment of key persons (incl supervisors)</i>	<b>Prof. Niina Käyhkö</b> (F) is Associate Professor in Digital Geospatial Research, Head of UTU Geospatial Resources and Head of UTU Tanzania Research Team. She is also Adjunct Professor in Landscape Geography. She is expert in geospatial land change analysis, participatory GIS methods and geospatial training. She has led around 20 research, education, business and development cooperation projects and has 15 years of research and geospatial competence development experience in Tanzania. Prof. Käyhkö is/has been supervisor to 7 PhDs. She leads WP1 and is main supervisor of ESR4 and 15, and is REVOLUTION's Training Development Officer (20% fte). <b>Prof. Petteri Alho</b> (M) is Professor in Floods and Fluvial Processes and Head of the Fluvial Research Group at UTU. He has had Adjunct Professorships in Hydrogeography and Remote Sensing Applications in Hydrology. He has project management responsibilities in >15 collaborative national and international research projects. He is/has been supervisor to 11 PhD/DrSc students. He has also been board member in national VALUE Doctoral Program. He is co-supervisor to ESR3 and 12, and PhD supervisor to the latter (8% fte). <b>Dr. Elina Kasvi</b> is an expert in fluvial geomorphology and riverine processes, close range remote sensing methods (Lidar, photogrammetry, acoustic methods), and computational modelling. She is/has been supervisor to 1 PhD. She is supervisor of ESR4 (5% fte). <b>Dr. Carlos Gonzales Inca</b> is an expert in environmental modelling, spatio-temporal analysis, image processing and machine learning algorithms. He is supervisor of ESR15 (5% fte).
<i>Key research facilities, infrastructures and equipment</i>	Geospatial research and education facilities at UTU consist of digital laboratories and units equipped with hardware and software, which are linked into centralised IT management and services. Our facilities provide the backbone for geospatial research and teaching, where the Department of Geography and Geology is the leading unit. At the department, we have a GIS teaching class with 34 workstations with most common GIS- and image processing software installed (both OS and most common proprietary software). We also have a geospatial modelling lab equipped with 6 powerful workstations, including double monitors and one planar stereo-monitor. Besides laboratories, we utilise a wide range of equipment ranging from RIEGEL VZ-400 Terrestrial Laser Scanner and Trimble TSC3 controller with R8 GNSS receiver to handheld GPS devices, field laptops, and drones. All of this equipment is owned by UTU and available for ESRs without any cost.
<i>Status of research premises</i>	All the above listed facilities and equipment are owned by UTU and available for ESRs without any cost. Research premises are owned by UTU and independent from other beneficiaries and/or partners.
<i>Previous involvement in research and training programmes, including ITN</i>	In FP7, funding for UTU amounted to €31 million with 88 projects, of which UTU coordinated 10. Within FP6, UTU participated in 48 projects. A total of 10 grants were acquired from Marie Skłodowska-Curie funding, and 6 from the European Research Council. Prof. Käyhkö has been PI in multiple Research and Higher Education Capacity Development projects since 2003 in Tanzania with local universities, with funding from the Academy of Finland and Ministry for Foreign Affairs of Finland. She is a founding member and UTU representative in the Finnish University Network in Geoinformatics, where 7 universities cooperate on research and education. Prof. Alho has been PI of several flood modelling and risk related projects with national science and business funding since 2007 (e.g. FINFLOODS; FLOODAWARE; GIFLOOD; RivChange). He has also been a board member of the national flood related graduate programme VALUE.
<i>Current involvement in research and training programmes, including ITN</i>	In H2020, the University of Turku has so far secured 48 projects including 5 ERC projects and 14 Marie Curie projects (6 IF, 7 ITN, and 1 NIGHT). UTU coordinates 3 research consortiums and is a partner in 26 research consortia. UTU is a Copernicus Academy member, member of EARSeL and AGILE and Geo4All networks. Prof. Käyhkö is senior expert in a Finnish National Research Infrastructure (FIRI) funded project OGIIR, where open geospatial research infrastructure is being developed for Finland (2017-2019). She is PI of a large five university-wide Higher Education Capacity Development project GEO-ICT in Tanzania (2017-2020) and PI of a World Bank funded capacity development project (2018-2020) with the same universities (UDSM, ARU, SUZA, SUA). She is also a PI of three other research and business-related projects in Tanzania (ZAN-SDI, GESEC, SUSLAND), and a PI of Baltic Sat Apps Interreg-project (2018-2020), where Copernicus Satellite Data uptake and business innovations are promoted in the Baltic Sea Region. Prof. Alho is PI from UTU in a large strategic research funding consortium COMBAT, where disruptive technologies of 3D digitalisation, robotics, geospatial information and image processing are developed for a Point Cloud Ecosystem. He is also senior expert in Dam Safety Technology project (2017-18).
<i>Submission of similar proposals under the same H2020-MSCA-ITN-2020 call</i>	Not submitted other similar proposals under the same H2020-MSCA-ITN-2020 call.
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>• Koskinen, J., Leinonen, U., Vollrath, A., Ortmann, A., Lindquist, E., d'Annunzio, R., Pekkarinen, A., <b>Käyhkö, N.</b>, 2019. Participatory mapping of forest plantations with Open Foris and Google Earth Engine. <i>ISPRS J. Photogramm.</i>, 148, 63-74</li> <li>• Kukkonen, M., Muhammad, M.J., <b>Käyhkö, N.</b>, Luoto, M., 2018. Urban expansion in Zanzibar City, Tanzania: Analyzing quantity, spatial patterns and effects of alternative planning approaches. <i>Land Use Policy</i>, 71, 554-565</li> <li>• Calle, M., <b>Alho, P.</b>, Benito, G., 2017. Channel dynamics and geomorphic resilience in an ephemeral Mediterranean river affected by gravel mining. <i>Geomorphology</i>, 285, 333-346</li> <li>• Flener, C., <b>Alho, P.</b> et al., 2013. Seamless mapping of river channels at high resolution using mobile LiDAR and UAV-photography. <i>Remote Sensing</i>, 5(12), 6382-6407.</li> <li>• Fagerholm, N. <b>Käyhkö, N.</b>, Ndumbaro, F., Khamis, M., 2012. Community stakeholders' knowledge in landscape assessments – mapping indicators for landscape services. <i>Ecol. Indic.</i>, 18, 421-433.</li> </ul>



REVOLUTION – ETN

Beneficiary 3: Technische Universiteit Delft (DUT)	
<i>General description</i>	Delft University of Technology (DUT) is a Global Top 100 research and training intensive university aiming to make a significant contribution towards a more sustainable society. DUT conducts ground-breaking scientific and technological research that is acknowledged as world-class, training academic staff with a genuine commitment to society, and helps to translate knowledge into technological innovations and activity with both economic and social value. With nearly 480 fte scientific staff members, 4,800 students, and a budget of over €66 million, the Faculty of Civil Engineering and Geosciences is one of the largest of the eight faculties at DUT. The Faculty comprises six related scientific departments which also contribute to its two Bachelors and four Masters programmes. These departments include: Geoscience & Engineering; Geoscience & Remote Sensing; Hydraulic Engineering; Structural Engineering; Transport & Planning; and Water Management.
<i>Role and commitment of key persons (incl supervisors)</i>	<b>Prof. Hessel Winsemius</b> (M) is Associate Professor at the Chair of Water Resources Management (WRM), and works on global to local scale understanding of hydrological flood processes and socio-economic risks. He has a wide network in Dar es Salaam including the Tanzania Red Cross Society, World Bank, and Dutch Embassy. He is/has been supervisor to 7 PhDs. He leads WP2, is the REVOLUTION Research Development Officer, is main supervisor of ESR13, and co-supervisor of ESR12 (18%). <b>Prof. Marie-Claire ten Veldhuis</b> (F) is Associate Professor at WRM, and works on urban flood risk analysis using blended observations and modelling for improving predictions and early-warning services for urban pluvial floods. She has extensive experience in European research and innovation projects, including IA, RIA and ETN. She is involved in H2020_Insurance, working on improved rainfall information to support micro-insurance for farmers in Tanzania. She is/has been supervisor to 6 PhDs. She is co-supervisor and PhD supervisor to ESR5 (5% fte). <b>Prof. Rolf Hut</b> (M) is Assistant Professor at WRM. He is Principal Investigator on the eWaterCycle and eWaterCycle II projects. He works on the combination of global hydrological modelling and designing innovative sensors for hydrology. He is/has been supervisor to 3 PhDs. He is main supervisor of ESR1 (5% fte). <b>Prof. Christian Tiberius</b> (M) is an Associate Professor at the Department of Geoscience and Remote Sensing. He has been involved in GNSS positioning and navigation research since 1991, with emphasis on data quality control, precise point positioning and applications of precision positioning at large scale. He is/has been supervisor to 7 PhDs. He is supervisor to ESR1 (5% fte). <b>Prof. Oswaldo Morales Napoles</b> (M) is Assistant Professor of probabilistic design within the section of Flood Risks and Hydraulic Structures. His research interests are in development of methods for characterising multivariate probability distributions, uncertainty analysis, structure expert judgments and their applications mostly in science and engineering. During his tenure at the Netherlands Organisation for Applied Scientific Research he led a group of scientists around these subjects. He has collaborated with different institutions around the world such as the Harvard School of Public Health and the Mexican Institute of Ecology and Climate Change. He is/has been supervisor to 4 PhD researchers. He is supervisor to ESR13 (5% fte).
<i>Key research facilities, infrastructures and equipment</i>	WRM currently hosts >20 PhDs, supervised by >10 academic staff. The group has a culture of staff supporting each other, and each other's PhDs. Staff and PhDs are supported by the graduate school of DUT to make sure that PhDs receive both the scientific as well as personal support needed to grow. Staff collaborate routinely on large projects. WRM shares a physical lab with the hydraulic and sanitary engineering groups, giving WRM access to research equipment such as flumes, a full-fledged chemical analyses lab (including isotopes and spectography), and copious open space to develop first principal tests of novel measurement methods. WRM has experience with and availability of UAV equipment. Prof. Hut has used this lab for previous work on sensor design and will continue to do so in this project. Through eWaterCycle II, we have access to and experience with the eScience centre HPC facilities under the support of SURFsara, the collaborative ICT organisation for Dutch education and research.
<i>Status of research premises</i>	The lab at Delft University of Technology is fully owned by DUT and independent from other beneficiaries and/or partners.
<i>Previous involvement in research and training programmes, including ITN</i>	In FP7, DUT coordinated 107, and partnered in 313, awarded grants. Of specific interest to this project is the involvement of DUT in the "Switch-ON, Open Data for Water Resources" FP7 project and the leading role in the H2020 BRIGAD (BRIdging the Gap for Innovations in Disaster resilience) projects. Furthermore, the "Water and Weather Monitoring Services for Ghana's Cocoa region: Innovative weather sensing and information services for local farmers", funded by Netherlands Organisation for Scientific Research (NWO), highlights DUT's expertise in both sensor design and successfully implementing novel sensor solutions to the benefits of relevant local stakeholders.
<i>Current involvement in research and training programmes, including ITN</i>	DUT has acquired 260 grants within the H2020 framework of which 75 are Marie Skłodowska Curie projects (of which 33 IFs and 33 ITNs). Especially relevant to this proposal is the work carried out in the TWIGA project (Transforming Water, Weather and Climate Information through In Situ Observations for Geo-Services in Africa), which is led by WRM's head, Prof. Dr. Ir Nick van de Giesen.
<i>Submission of similar proposals under the same H2020-MSCA-ITN-2020 call</i>	Not submitted other similar proposals under the same H2020-MSCA-ITN-2020 call.
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>• <b>Winsemius, H.C., Jongman, B., Veldkamp, T.I.E., Hallegatte, S., Bangalore, M., Ward, P.J.</b>, 2018. Disaster risk, climate change, and poverty. <i>Environ. Dev. Econ.</i>, 23, 328-348</li> <li>• <b>Donchyts, G., Baart, F., Winsemius, H.C., Gorelick, N., Kwadijk, J., Van de Giesen, N. C.</b> et al., 2016: Earth's surface water change over the past 30 years. <i>Nat. Clim. Change</i>, 6(9), 810-813</li> <li>• <b>Hut, R., Tyler, S., Van Emmerik, T.</b>, 2016: Proof of concept: temperature-sensing waders for environmental sciences. <i>Geosci. Instrum. Method. Data Syst.</i>, 5, 45-51</li> <li>• <b>Winsemius, H.C., Aerts, J.C.J.H., Ward, P.J.</b>, 2015. Global drivers of future river flood risk, <i>Nat. Clim. Change</i>, 6(4), 381-385; and related Aqueduct Global Flood Analyzer (<a href="http://www.wri.org/floods">www.wri.org/floods</a>)</li> <li>• Van de Giesen, N.C., <b>Hut, R.</b> and Selker, J., 2014. The Trans-African Hydro-Meteorological Observatory (TAHMO). <i>WIREs Water</i>, 1, 341-348</li> </ul>

REVOLUTION – ETN

Beneficiary 4: FutureWater SL (FW)	
<i>General description</i>	FutureWater (FW) offers research and consulting services and combines the latest scientific developments with practical solutions for water management to a wide variety of clients throughout the world. FW uses state-of-the-art, open-source quantitative methods to support decision making in water resource management. The company was founded in 2002 and has offices in Spain and the Netherlands. FW is closely linked to leading universities and research institutes, ensuring the use of the latest and most advanced techniques and tools for data management, hydrological simulation models, Geographic Information Systems, hydro-informatics, and Remote Sensing. FW works at the global, regional, national, and local levels with partners on projects addressing water for food, energy, irrigation, water excess, water shortage, climate change, and river basin management. FW is specialized in working with a combination of large satellite-based datasets related to water and land management, and large climate datasets, including model projections. These data products are used to assess impacts related to floods, droughts, irrigation, hydropower, and food production. A wide range of tools is used, each selected to fit the specific assignment at hand – from strategic to operational decision making, and from field scale to global scale. Commonly used tools include water resource models, water allocation models, and the spatially distributed hydrological model SPHY, developed in-house. FW has extensive experience on data mining, data organisation, translating data to knowledge, and transferring its knowledge through training sessions and capacity building. FW’s technical and managerial capabilities have been proven by numerous projects that were completed successfully. Technical capabilities are demonstrated by the large number of consulting projects on modelling, data analysis, remote sensing, and climate change that were also published in scientific literature and high-quality reports. FW’s clients include IFI’s like Asian Development Bank, World Bank, NGOs like WWF, The Nature Conservancy, River Basin Organizations like the Mekong River Commission and Nile Basin Initiative, water boards and farmers’ associations, Universities, among others.
<i>Role and commitment of key persons (incl supervisors)</i>	<b>Dr. Johannes Hunink</b> (M) is Managing Director of FutureWater in Spain. He is a hydrologist with 15 years’ experience in decision support studies for water resources management. He is experienced in the use of simulation models and remote sensing for the impact evaluation of water investment portfolios, flood and drought mitigation interventions, and water-related ecosystem-services assessments. He is skilled in integrating large datasets and numerical tools to solve complex spatial problems related to water management. He has been project manager and/or leading analyst in a wide range of research and consultancy projects all around the world, including professional training. He is/has been actively contributing to the supervision of 3 PhDs. He leads WP3, is main supervisor of ESR10, supervisor of ESR8, and co-supervisor of ESR9 (18% fte). <b>Dr. Sergio Contreras</b> (M) is an ecohydrologist and drought and remote sensing expert with more than 10 years of career as researcher and consultant in water resources assessment, hydrological and water allocation modelling, and geomatic technologies. He leads the InfoDrought pilot project focused on the development and testing of a fully-integrated Drought Monitoring-Management System, and the Work Package on “Drought and Innovations” of the EU-H2020 BRIGAD project. He has actively participated in many international and Spanish research projects and contracts. He is/has been actively contributing to the supervision of 3 PhDs. He is main supervisor to ESR8 and supervisor to ESR10 (8% fte).
<i>Key research facilities, infrastructures and equipment</i>	FW’s office in Cartagena, Spain, has fast computer facilities and support staff available to the ESRs. It also has a second office in Wageningen-Netherlands, with further experience in topics related to the proposed action. FW houses the spatially distributed hydrological model SPHY, developed in-house, and provides and hosts operational online services related to this action, as for example the drought portal <a href="http://www.infosequia.es">www.infosequia.es</a> .
<i>Status of research premises</i>	FW rents an office, which is independent from other beneficiaries and/or partners.
<i>Previous involvement in research and training programmes, including ITN</i>	The drought monitoring and assessment system <a href="http://www.infosequia.eu">www.infosequia.eu</a> FW developed was co-funded by a Torres Quevedo Grant of the Ministry of Economy of Spain, which allows integrating postdoc researchers in SMEs. FW has conducted and managed a large number of water-focused projects in Europe, Africa, Asia, and South America. Important clients and collaborators include River Basin Organisations, the World Bank, African Development Bank, Asian Development Bank, and National and Local Governments. Most of their consultancy assignments include a capacity component, often on water resources modelling, remote sensing data analysis, and agro-hydrological simulation models for impact assessments. Specific training programmes on these topics were organized for experts working at governmental organisations in Armenia, Kenya, Mozambique, Nepal and Gabon, among other countries.
<i>Current involvement in research and training programmes, including ITN</i>	FW is a beneficiary in the ongoing SYSTEM-RISK ITN, with 1 ESR currently enrolled and supervised by senior staff members (in the Netherlands office). FW led the work package on drought and agriculture in the H2020 project IMPREX and developed and coordinated several developments related to climate change, seasonal forecasts, drought, and agriculture. FW is currently involved in three other related H2020 projects. In BRIGAD, FW leads the work package on drought, with the goal of supporting a wide range of drought-related innovations in bridging the gap between prototype and market uptake. In TWIGA, on the use of citizen science and earth observations, FW is researching the use of drones for applications in agriculture and other sectors in Africa and has trained many local operators and local staff in data processing and data management. In G3P, starting in 2020, FW will develop a use-case for groundwater-data from the satellite platform GRACE.
<i>Submission of similar proposals under the same H2020-MSCA-ITN-2020 call</i>	Not submitted other similar proposals under the same H2020-MSCA-ITN-2020 call.
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>• García-León, D., <b>Contreras, S., Hunink, J.E.</b>, 2018. A comparison of meteorological and satellite-based drought indices as yield predictors of Spanish winter cereals. <i>Agr. Water Manage.</i>, 213, 388-396.</li> <li>• <b>Hunink, J.E.</b>, Eekhout, J.P.C., Vente, J.D, <b>Contreras, S.</b>, Droogers, P., Baille, A., 2017. Hydrological modelling using satellite-based crop coefficients: a comparison of methods at the basin scale. <i>Remote Sensing</i>, 9, 174</li> <li>• Van den Hurk, B.J.J.M., <b>Hunink, J.E.</b>, <b>Ward, P.J.</b> et al., 2016. Improving predictions and management of hydrological extremes through climate services. <i>Climate Services</i>, 1, 6-11</li> <li>• <b>Hunink, J.E.</b>, <b>Contreras</b>, Soto-García, M., Martín-Gorriç, B., Martínez-Álvarez, V., Baille, A., 2015. Estimating groundwater use patterns of perennial and seasonal crops in a Mediterranean irrigation scheme, using remote sensing. <i>Agr. Water Manage.</i>, 162, 47-56</li> <li>• <b>Contreras, S., Hunink, J.E.</b>, 2015. Drought effects on rainfed agriculture using standardized indices: A case study in SE Spain. In Andreu et al. (eds.) Droughts: Research and Science-Policy Interfacing, 65-70. CRC Press (Taylor and Francis Group). London.</li> </ul>

REVOLUTION – ETN

Beneficiary 5: Stichting International Red Cross Red Crescent Centre on Climate Change and Disaster Preparedness (RC)	
<i>General description</i>	The Red Cross Red Crescent Climate Centre (RC) supports the Red Cross and Red Crescent Movement and its partners in reducing the impacts of climate change and extreme weather events on vulnerable people. RC works at the interface of science, policy, and practice, shaping research and international policy discussions on climate risk management. On the ground, RC provides practical support to Red Cross Red Crescent Societies in 191 countries, collaborating with governments, multilaterals, universities, and civil society. RC is pioneering a climate risk management strategy called Forecast-based Financing, which ensures humanitarian funding is available when there is a weather or climate forecast of a potential disaster. RC has supported the launch of a new international fund for forecast-based action, and is developing programmes in more than 16 countries to automatically trigger humanitarian action when forecasts indicate high risk of extreme events. Positively received at the Third UN World Conference on Disaster Risk Reduction and multiple Conference of Parties to the United Nations Convention on Climate Change, the humanitarian sector pledged to rapidly scale up its work on Forecast-based Financing during the World Humanitarian Summit in 2016. RC also supports the humanitarian and development sectors to address long term climate risk management, holding international roles as knowledge manager, communication, and dissemination, in the Building Resilience for Climate Extremes and Disasters (BRACED) programme, and climate risk partner in the Partners for Resilience Programme.
<i>Role and commitment of key persons (incl supervisors)</i>	<b>Dr. Erin Coughlan de Perez</b> (F) is RC's Manager of Climate Science and adjunct at the International Research Institute for Climate and Society at Columbia University in New York, delivering real-time decision-making support in response to climate-related questions from humanitarians. She also designs participatory games for capacity building and climate change awareness and manages several projects, including forecast-based financing in Uganda and Togo. A major aspect of her work is the communication and dissemination of knowledge between scientists and practitioners. She holds a PhD in forecast-based financing. She has supervised 6 Junior Researchers since 2011. She leads WP5, is supervisor of ESR5, and co-supervisor of ESR4 (13% fte). <b>Prof. Maarten van Aalst</b> (M) is Director of RC, Full Professor at TU Twente, and holds adjunct appointments at the International Research Institute for Climate and Society at Columbia University, the Department of Science, Technology, Engineering and Public Policy at University College London, and the Overseas Development Institute in London where he co-chairs the knowledge management group for the BRACED resilience programme. He also serves on the leadership team of the Partners for Resilience alliance, and on advisory boards of several major international research programmes on climate risk management. He is/has been supervisor to 4 PhDs. He is main supervisor of ESR5 (5% fte). <b>Sanne Hogesteeger</b> (F) is Technical Advisor at RC and is project coordinator for the Partners for Resilience programme. She has extensive communication and dissemination expertise and will provide technical support to WP5 (5% fte).
<i>Key research facilities, infrastructures and equipment</i>	RC has adequate facilities and infrastructure to host and support ESRs, including its own administrative staff and office with desks, meeting rooms, and phone booths. In addition, RC brings to the table its extensive network of Red Cross Red Crescent Societies in 191 countries. Partnerships can allow for staff or researchers to spend time in the office of a National Society, such as Tanzania Red Cross.
<i>Status of research premises</i>	RC rents an office, which is independent from other beneficiaries and/or partners
<i>Previous involvement in research and training programmes, including ITN</i>	RC has hosted about 10 Junior Researchers per year since 2008, with more than 100 having passed through the programme in that time. We have facilitated access to data in the humanitarian sector for the researchers to analyse data, and have enabled students to be hosted in practical settings around the world. Students have come from more than 40 universities around the world, and have continued on to work at the World Bank, universities, and governments, among other careers.
<i>Current involvement in research and training programmes, including ITN</i>	RC is currently involved in several research and training programmes, including FATHUM and FRACTAL. This work includes the development of shock-responsive social protection systems, Reality of Resilience work around learning from climate extremes; a Climate and Weather Information Helpdesk; and facilitation of dialogue among scientists and disaster managers. RC works as part of the Knowledge Manager of the BRACED consortium and the SHEAR consortiums, leading dissemination and communication of research findings and brokering discussions with practitioners around the world. RC also holds a convening or leading role at several international conferences to disseminate and discuss research, including Understand Risk, Development and Climate Days at the UNFCCC COPs, and the FbF Dialogue Platforms.
<i>Submission of similar proposals under the same H2020-MSCA-ITN-2020 call</i>	Not submitted other similar proposals under the same H2020-MSCA-ITN-2020 call.
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>● <b>Coughlan de Perez, E.</b>, Stephens, E., Bischiniotis, K., <b>Van Aalst, M.</b>, Van den Hurk, B., Mason, S., Nissan, H. and Pappenberger, F., 2017. Should seasonal rainfall forecasts be used for flood preparedness? <i>Hydrol. Earth. Syst. Sc.</i>, 21, 4517-4524.</li> <li>● Nissan H., Burkart K., <b>Coughlan de Perez E.</b>, <b>Van Aalst, M.</b>, Mason S., 2017. Defining and predicting heat waves in Bangladesh. <i>J. Appl. Meteorol. Climatol.</i>, 56, 2653-2670</li> <li>● <b>Coughlan de Perez E.</b>, Van den Hurk B., <b>Van Aalst M.</b>, et al., 2016. Action-based flood forecasting for triggering humanitarian action. <i>Hydrol. Earth Syst. Sci.</i>, 20, 3549-3560</li> <li>● <b>Coughlan de Perez, E.</b>, Monasso, F., <b>Van Aalst, M.</b>, Suarez, P., 2014. Science to Prevent Disasters. <i>Nat. Geosci.</i>, 7, 78-79</li> <li>● <b>Coughlan de Perez E.</b>, Mason S., 2014. Climate Information for Humanitarian Agencies: Some Basic Principles. <i>Earth Perspectives</i>, 1, 11</li> </ul>

REVOLUTION – ETN

Beneficiary 6: Deutsches Zentrum Fuer Luft- Und Raumfahrt EV (DLR)	
<i>General description</i>	The German Aerospace Center (DLR) is Germany's national research centre for aeronautics and space. Its extensive research and development work in aeronautics, space, transportation and energy is integrated into national and international cooperative ventures. Approximately 8000 people work for DLR at 40 institutes and facilities at 20 locations in Germany. In DLR, this project will be held by the German Remote Sensing Data Center (DFD), Land Surface Dynamics (LAX) department, which is responsible for Earth Observation (EO) data reception, archiving and dissemination as well as the operation of thematic user services. Research and development at DFD covers all domains of remote sensing of the Earth and DFD is developing procedures and information systems to meet urgent challenges caused by global change and human impact. Among the 6 teams composing the DLR-DFD LAX department, the Smart Cities and Spatial Development team will be responsible for supporting REVOLUTION. In particular, the team: (1) is at the forefront of the research in urban remote sensing; (2) develops remote sensing methods and information products to support a sustainable management of urban areas and cultural landscapes; and (3) is involved in the definition and design of EO systems and missions as well as extensive R&D works for sustainable urban development, land management, physical urban structure analysis, vulnerability, energy, urban climate, and quality of life.
<i>Role and commitment of key persons (incl supervisors)</i>	<b>Dr. Eng. Mattia Marconcini</b> (M) is project manager and research scientist in the Smart Cities and Spatial Development team at DLR-DFD Land Surface Dynamics Department. He received B.S. and M.S. degrees in telecommunication and engineering, and a Ph.D. degree in information and communication technologies from the University of Trento, Italy, in 2002, 2004, and 2008, respectively. Between 2004 and 2008 he worked in the Remote Sensing Laboratory of the Department of Information Engineering and Computer Science at the University of Trento. From 2008 to 2012 he was Research Fellow and Technical Officer at the European Space Agency. He is/has been supervisor of 3 PhDs and 15 MSc students. He is the main supervisor of ESR12&14 and co-supervisor of ESR13 (13% fte). <b>Dr. Annkatrin Metz</b> is research scientist in the Smart Cities and Spatial Development team at DLR-DFD Land Surface Dynamics Department. She received the Diploma degree in geography at the Dresden University of Technology in 2009 and the PhD degree in Remote Sensing and Natural Science at the University of Osnabrueck in 2016. She has been involved in several FP6, FP7, H2020 and ESA projects and has vast experience in remote sensing. She has supervised many master students and is supervisor of ESR12&14 (10% fte).
<i>Key research facilities, infrastructures and equipment</i>	At DLR-DFD two large-scale infrastructures are available, namely a Calvalus cluster system and the "Geofarm". The DLR Calvalus Cluster consists of 50 compute nodes with 32 GB RAM each and 1 quad-core Intel Xeon 3.4 GHz CPU, and a distributed file system with 700 TB. The GeoFarm is a private cloud system dedicated to the specific needs of a development and processing environment for geo-scientific information products based on EO data in combination with terrestrial observations. Within the next 2 years the system will encompass 4300 cores, 33TB RAM, 1.9PB SATA, 100TB SAS and 8TB SSD. In addition, the setup also includes human resources for coordination, integration, configuration and virtualisation of the environment. DLR owns, among other things, licenses for the use of ERDAS Imagine, TRIMBLE eCognition Developer/Architect, the ArcGIS suite, Exelis ENVI and IDL.
<i>Status of research premises</i>	Research premises are owned by DLR and are independent from other beneficiaries and/or partners.
<i>Previous involvement in research and training programmes, including ITN</i>	The Smart Cities and Spatial Development team at DLR has been involved in several national and international projects. Among these, the most relevant include: H2020 CURE (2020-2022) aimed at addressing sustainable and resilient urbanization by combining products of different Copernicus Core Services; H2020 URBANFLUXES (2015-2018) aimed at the analysis of cities' warming by exploiting EO data; FP7 DECUMANUS (2013-2015) aimed at the provision of EO-based products to city managers in support to the implementation of climate change adaptation and mitigation strategies; FP7 geoland2 (2008-2012) aimed at the operational mapping of urban areas using TerraSAR-X (Euroland) and the Seasonal and Annual Change Monitoring (SATChMo); ERA.NET RUS GEOURBAN (2013-2014) aimed at Demonstrating the ability of EO systems to depict parameters of urban structure and environmental quality; OPUS GMES (2013-2017, funded by the Bavarian Ministry of Economic Affairs and Media, Energy and Technology) aimed at the development and demonstration of concepts for implementing high-performance access to Sentinel data streams; and DELIGHT (2012-2015, funded by the German Federal Ministry of Education and Research) aimed at the identification and development of strategies for sustainable development of urbanised areas in the Yellow River Delta (China).
<i>Current involvement in research and training programmes, including ITN</i>	The Smart Cities and Spatial Development team at DLR is currently involved - among others - in the following key projects: H2020 ECoLaSS (2016-2019) aimed at developing several prototypes of new or enhanced Copernicus Land services making full use of dense time series of SAR and optical Sentinel EO data; ERA-NET Sen4Rus (2016 - 2019) aimed at developing a set of indicators by exploiting the Copernicus Sentinels in support of urban and peri-urban planning; ESA Urban Thematic Exploitation Platform (2015-2022) aimed at fostering the use of ICT technologies and services to bridge the gap between the technology-driven EO sector and the needs of urban and environmental science, planning, and policy.
<i>Submission of similar proposals under the same H2020-MSCA-ITN-2020 call</i>	Not submitted other similar proposals under the same H2020-MSCA-ITN-2020 call.
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>• Cian, F., <b>Marconcini, M.</b>, Ceccato, P., Giupponi, C., 2018. Flood depth estimation by means of high-resolution SAR images and LiDAR data. <i>Nat. Haz. Earth Syst. Sci. Discuss.</i>, doi:10.5194/nhess-2018-158</li> <li>• Cian, F., <b>Marconcini, M.</b>, Ceccato, P., 2018. Normalized Difference Flood Index for rapid flood mapping: Taking advantage of EO big data. <i>Remote Sensing of Environment</i>, 209, 712-730</li> <li>• Esch, T, <b>Metz, A.</b> et al., 2018. Digital world meets urban planet – new prospects for evidence-based urban studies arising from joint exploitation of big earth data, information technology and shared knowledge. <i>Int. J. Digit. Earth.</i>, online first doi:10.1080/17538947.2018.1548655.</li> <li>• Chrysoulakis, N., <b>Marconcini, M.</b> et al., 2014. A conceptual list of indicators for urban planning and management based on Earth observation. <i>ISPRS Int. Geo-Inf.</i>, 3, 980-1002</li> <li>• <b>Marconcini, M.</b>, Marmanis, D., Esch, T., Felbier, A., 2014. A novel method for building height estimation using TanDEM-X data. <i>Proceedings of the 2014 IEEE International Geoscience and Remote Sensing</i></li> </ul>

REVOLUTION – ETN

Beneficiary 7: Albert-Ludwigs-Universität Freiburg (ALU-FR)	
<i>General description</i>	The Albert-Ludwigs-University Freiburg, with nearly 25,000 students and over 5,000 academic employees, is one of Germany's leading research and education institutions with an international reputation in many fields. It has been a comprehensive university since its founding in 1457, and its diversity of disciplines provides an ideal environment for innovative interdisciplinary studies. It is a member of LERU (League of European Research Universities).
<i>Role and commitment of key persons (incl supervisors)</i>	<b>Prof. Kerstin Stahl</b> is Full Professor for Environmental Hydrological Systems in the Faculty of Environment and Natural Resources, which focuses on applied environmental research and has experience with all EU project formats. Prof. Stahl's group focuses on drought hazard and risk assessment, low flow and mountain hydrology. Her research pioneered the approach of linking drought indicators to drought impacts to inform drought early warning. Prof. Stahl has a track-record on transdisciplinary research project leads and the European Drought Impact report Inventory developed under her direction as work package leader in the EU FP7 project DROUGHT-R&SPI will be developed and put to use in this ITN. She is/has been supervisor to 13 PhDs, and over the past 4 years about one has graduated per year. She is main supervisor of ESR6 and co-supervisor (and PhD supervisor) of ESR 8 (10% fte). <b>Dr. Inge de Graaf</b> is a high potential early career scientist and lecturer on track towards qualification for a professorship with expertise in large-scale groundwater modelling and groundwater sustainability. She has extensive experience in teaching and has advised 1 PhD student and 1 Masters student on similar model approaches as planned in this ITN. She is supervisor of ESR6 (5% fte).
<i>Key research facilities, infrastructures and equipment</i>	ALU-FR has an "International Graduate Academy" (IGA) that offers a transdisciplinary qualification program to PhD students. <b>Prof. Stahl</b> currently serves in the directorate of the Faculty of Environment and Natural Resources' Graduate School "Environment, Society and Global Change" (ESGC) which provides structure and support to PhD student and postdocs. ESRs will have access to the large range of courses and mentoring programs under these umbrellas. Research infrastructure in the Chair of Environmental Hydrological Systems includes state of the art computer equipment dedicated for research purposes. The University's computing centre offers High Performing Computing facilities, expertise, and technical support. The three chairs in hydrology together employ 30-40 scientists and technicians and also have a range of field equipment, wet labs and water chemistry laboratories including state of the art water stable isotope analyzers. Regular research colloquia, workshops and many international guests form a vibrant research environment.
<i>Status of research premises</i>	Research premises owned by ALU-FR and independent from other beneficiaries and/or partners
<i>Previous involvement in research and training programmes, including ITN</i>	ALU-FR has several graduate schools and cooperates in the training of doctoral students with European universities, e.g. the EUCOR network. ALU-FR has a solid track record in training experienced and postdoctoral researchers. During FP7, the University acquired ca. 130 EU-Projects among which was the DROUGHT-R&SPI project that under <b>Prof. Stahl's</b> lead constructed the database and impact function methodology that ESR8 will directly build on. Overall, in FP7, ALU-FRs acquired ca. 20 ERC-Grants and a total of 24 Marie-Curie-Projects, among the latter 9 ITNs (MITT (238514); ICONIC (238671); HiggsTools (316704); SHeMat (290308); SIREN (214788); PHOTO.COMM (317184); FACETS-ITN (237955); NAMASEN (264872); TEMPO (607957), 12 individual fellowships and one COFUND-Programme.
<i>Current involvement in research and training programmes, including ITN</i>	Under Horizon 2020, ALU-FR has already been successful in acquiring 71 Projects, including 12 Marie Skłodowska-Curie ITNs and one COFUND-Programme; two ERC Advanced Grants, eight ERC Consolidator Grants and twelve ERC Starting Grants. <b>Prof. Stahl</b> has just won a new INTERREG Alpine Space Programme Project, the Alpine Drought Observatory (ADO), which will have strong thematic links to the planned ITN. The University of Freiburg is currently involved in ten ITN projects: VITRIMAT (860911); EN_ACTI2NG (721358); PlaMaTsu (7222842); MossTech (765115); PHOTO-EMULSION (765341); MICROCOMB (812818); CreaNet (812868); PERICO (812968); synBIOcarb (814029); EuSNN (860563); within the faculty a similar-format DFG funded research training school CONFOBI has been running successfully over the past years. The COFUND programme with the Freiburg Institute of Advanced Studies (FRIAS) in which <b>Prof. Stahl</b> is currently a senior internal fellow, has consistently attracted international reputation. The ESRs coming to ALU-FR will have the possibility to be part of the Faculty of Environment and Natural Resources' Graduate School Environment, Society and Global Change (ESGC) and participate in transdisciplinary qualification program offered by the central "International Graduate Academy" (IGA). Female ESRs can join the "kite-mentoring" program for career development.
<i>Submission of similar proposals under the same H2020-MSCA-ITN-2020 call</i>	Not submitted other similar proposals under the same H2020-MSCA-ITN-2020 call.
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>• <b>De Graaf, I.E.M.</b>, Gleeson, T., Van Beek, L.P.H., Sutanudjaja, E.H., Bierkens, M.F.P., 2019. Limits to global groundwater pumping, <i>Nature</i>, 574, 90-94</li> <li>• <b>De Graaf, I.E.M.</b>, Van Beek, L.P.H., Gleeson, T., Moosdorf, N., Schmitz, O., Sutanudjaja, E.H., Bierkens, M.F.P., 2017. A global-scale two-layer transient groundwater model: Development and application to groundwater depletion. <i>Adv. Water Resour.</i>, 102, 53-67</li> <li>• Bachmair, S., Svensson, C., Prosdocimi, I., Hannaford, J., <b>Stahl, K.</b>, 2017. Developing drought impact functions for drought risk management. <i>Nat. Hazard. Earth Sys.</i>, 17, 1947-1960</li> <li>• <b>Stahl, K.</b>, Kohn, I., Blauhut, V., Urquijo, J., De Stefano, L., Acácio, V., Dias, S., Stagge, J.H., Tallaksen, L.M., Kampragou, E., Van Loon, A.F., Barker, L.J., Melsen, L.A., Bifulco, C., Musolino, D., de Carli, A., Massarutto, A., Assimacopoulos, D., Van Lanen, H.A.J., 2016. Impacts of European drought events: insights from an international database of text-based reports <i>Nat. Hazard. Earth Sys.</i>, 16, 801-819</li> <li>• Blauhut V., Gudmundsson, L., <b>Stahl, K.</b> 2015. Towards pan-European drought risk maps: quantifying the link between drought indices and reported drought impacts <i>Environ. Res. Lett.</i>, 10, 014008</li> </ul>

REVOLUTION – ETN

Beneficiary 8: King's College London (KCL)	
<i>General description</i>	King's College London (KCL) is one of the world's leading research and teaching institutions. In the 2018-2019 QS international world rankings, KCL was ranked as one of the top 10 UK universities in the world. In the 2014 Research Excellence Framework (REF) KCL was ranked 6 <sup>th</sup> nationally in the 'power' ranking, which takes into account both the quality and quantity of research activity, and 84% of research at KCL was deemed 'world-leading' or 'internationally excellent' (3* and 4*). The Department of Geography houses KCL Centre for Integrated Research on Risk & Resilience, a Recognised Centre for Excellence on Risk Information & Action of the ICSU programme IRDR. In addition, hazards researchers at KCL are involved in agenda setting research, in addition to providing research & policy support to DFID, DEFRA & IPCC on disaster risk reduction & climate change. Research related to aquatic environmental science at scales from the local to the global and across disciplinary boundaries in the fields of both basic and applied ecosystem ecology and ecotoxicology
<i>Role and commitment of key persons (incl supervisors)</i>	<b>Dr Michael Chadwick (M)</b> is an environmental scientist focused on studying urban ecosystem structure and function in aquatic systems. His research over the past 15 years had included projects on the large, tidally influenced rivers, headwater streams and a wide range of urban catchments. He has published over 40 peer-reviewed papers, including collaborative projects with funded PhD students. Dr Chadwick has received funding NERC, US Fish and Wildlife Service and the Royal Geographical Society. For the past six year, he has been part of the NERC London Doctoral Training Partnership and has been on six PhD supervisory committees to date. Research projects have included a range of partners including government agencies (e.g., SJRWMD, EA, CEH, Highways Agency, Crown Estate) and NGOs (e.g., Thames 21, Wandle Trust). To date he supervised 12 PhD students. He is main supervisor of ESR2 (5% fte). <b>Dr Faith Taylor (F)</b> is a lecturer in physical geography with interests in geographic information systems (GIS), spatial modelling, statistics and natural hazards. Between 2015 and 2017, she undertook two post-doctoral research positions at KCL, with a focus on hazard and risk in towns and cities in the Global South. She is PI of a Natural Environment Research Council (NERC) project using qualitative GIS to map resilience to flooding in informal settlements in Nairobi (Kenya). Dr. Taylor is currently supervisor to 2 PhD students. She is supervisor of ESR2 and co-supervisor of ESR15 (8% fte).
<i>Key research facilities, infrastructures and equipment</i>	The Department of Geography is home to a million-pound, multi-faceted teaching and research space. It facilitates the study of physical sciences and connects students and researchers in their exploration of the environment. Located on the Strand Campus, the John B Thorne Lab consists of a large central teaching zone, complemented by five auxiliary labs. It also hosts our Environmental Dynamics research group.
<i>Status of research premises</i>	Research premises owned by KCL and independent from other beneficiaries and/or partners.
<i>Previous involvement in research and training programmes, including ITN</i>	KCL has been involved in over 300 European Commission projects across FP7 and H2020. Previous relevant research projects include: ESRC-DFID Urban Africa Risk Knowledge, GCRF Why we Disagree about Resilience both looking at urban risk in Africa.
<i>Current involvement in research and training programmes, including ITN</i>	KCL is in the top seven UK universities for research earnings and has an overall annual income of more than £600 million from a diverse range of funding bodies. KCL currently has around 140 active projects funded by the European Commission. Of these, around a third are coordinated by the College. The College currently hosts more than 30 European Research Council grants and around 35 Marie Skłodowska-Curie actions, including over 20 Individual Fellowships, and more than 14 Innovative Training Networks. The Department of Geography has one of the largest Graduate Schools of Geography in the UK. Currently, there are approximately 120 students registered for PhD programmes. Our students are supported by 40 academic staff in the Department, and by collaborative supervision with external individuals and organisations in the UK and worldwide, including a series of joint PhD programmes with international partners. The Department is a member of the Natural Environment Research Council (NERC) London Doctoral Training Programme and, providing core training and supervision to an annual cohort of doctoral students working on environmental science topics. The Department is also a member of equivalent doctoral training programmes from Economic & Social Research Council (ESRC). Relevant current research projects include the £17 million NERC GCRF Urban Disaster Resilience Hub (PI Pelling), NERC Towards Forecast-based Preparedness Action (ForPac): Probabilistic forecast information for defensible preparedness decision-making and action (Co-Is Pelling and Malamud), NERC Expressive Mapping of Resilient Futures (PI Taylor) and the Plus Alliance ( <a href="https://www.plusalliance.org/">https://www.plusalliance.org/</a> ) to study social-ecological indicators of sustainability global river basins.
<i>Submission of similar proposals under the same H2020-MSCA-ITN-2020 call</i>	Not submitted other similar proposals under the same H2020-MSCA-ITN-2020 call.
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>• Dodman, D., Adelekan, I., Brown, D., Leck, H., Manda, M., Mberu, B., Pelling, M., Rusca, M., Satterthwaite, D. <b>Taylor, F.</b>, 2019. A spectrum of methods for a spectrum of risk: Generating evidence to understand and reduce urban risk in sub-Saharan Africa. <i>Area</i>, 51, 586-594</li> <li>• Borie, M., Ziervogel, G., <b>Taylor, F.E.</b>, Millington, J.D., Sitas, R. and Pelling, M., 2019. Mapping (for) resilience across city scales: An opportunity to open-up conversations for more inclusive resilience policy?. <i>Environmental Science &amp; Policy</i>, 99, 1-9</li> <li>• <b>Chadwick, M.A.</b>, Dobberfuhl, D.R., Benke, A.C., Huryn, A.D., Suberkropp, K., Thiele, J.E., 2006. Urbanization affects stream ecosystem function by altering hydrology, chemistry, and biotic richness. <i>Ecological Applications</i>, 16, 1796-1807</li> <li>• Francis, R.A. <b>Chadwick, M.A.</b>, 2013. <i>Urban ecosystems: understanding the human environment</i>. Routledge</li> <li>• Francis, R.A., Millington, J.D. and <b>Chadwick, M.A.</b> 2016. <i>Urban landscape ecology: science, policy and practice</i>. Routledge.</li> </ul>

REVOLUTION – ETN

Beneficiary 9: Ardhi University (ARU)	
<i>General description</i>	Ardhi University (ARU) is a Public University engaged in research and training at all levels. It is a multidisciplinary university that also has a nationally and regionally unique set of research and training programmes in spatial data, land administrations, and the built environment. It thus serves as a regional centre of excellence in these sciences. It was a constituent of the larger University of Dar es Salaam until 2006. ARU has a current enrolment of over 4000 students and over 400 academic staff. Since 2010 it has awarded 31 PhDs degrees ARU has ongoing collaboration and research funding from the Swedish government through the Sida support, the World Bank through the Ministry of Education and Vocational Training, the Royal Government of Norway through its Royal Norwegian Embassy in Dar es Salaam and the European Commission under its various framework programmes. Others include the Australian Agency for International Development (AUSAID); the United States Agency for International Development (USAID); the National Environment Research Council (NERC) of United Kingdom and the Danish International Development Agency (DANIDA). For the past five years an average of over 70 peer reviews publications have been obtained annually, as well as 2 registered patents.
<i>Role and commitment of key persons (incl supervisors)</i>	<b>Prof. Ally Namangaya</b> (M) is a senior lecturer and Professor and Dean of the School of Spatial Planning and Social Sciences, which operates the Resilience Academy jointly with The World Bank. He is involved in citizen mapping sciences, alternative data capturing technologies, and community and wider others engagement in research. He is/has been supervisor of 4 PhDs. He is supervisor of ESR3 and co-supervisor of ESR4, and will locally coordinate the activities of the project in Tanzania (13% fte). <b>Prof. Evaristo Liwa</b> (M) is Associate Professor in Geodetic Sciences and a Vice Chancellor. He recently focuses on drone mapping technologies. He is/has been supervisor of 5 PhDs. He is co-supervisor of ESR1 and 2 (5% fte). <b>Dr. Joseph Mayunga</b> (M) is a disaster risk management specialist with high conversance with data, working with communities and institutionalising disaster risk management in research and practice. He is/has been supervisor of 5 PhDs. He is supervisor of ESR3 (5% fte).
<i>Key research facilities, infrastructures and equipment</i>	Infrastructure available at ARU includes state of the art computer equipment for data processing and a professional size drone. ARU has specialised geodetic laboratories in addition to environmental labs that serve also national research interests. Other facilities include survey equipment, ICT facilities, administrative support, and learning spaces.
<i>Status of research premises</i>	Research premises are owned by ARU and are independent from other beneficiaries and/or partners.
<i>Previous involvement in research and training programmes, including ITN</i>	There are various recently completed research engagements in the area of resilience under Science, Technology and Higher Education Project (STHEP); Sida Research Support Programme; Climate Change, Impacts, Adaptation and Mitigation (CCIAM) programme; African Urban Risk Analysis Network and Water Resilient Green Cities in Africa (WGA).
<i>Current involvement in research and training programmes, including ITN</i>	ARU operates the Resilience Academy, together with the World Bank, thereby offering excellent training required for addressing the pressing needs for 'future-ready' skill-sets of Africa's fast-changing disaster risks. In the area of resilience and disaster risks management the ongoing engagement include projects like Research and Innovation for Sustainable Land and Environmental Management for Inclusive Development” (STEM-ID); funded by SIDA, Governance and Planning of Resiliency Cities in East Africa (GOPLAREA): Funded by BMBF and DAAD, Germany Government; the Partners Enhancing Resilience to People Exposed to Risks – Universities (PERI PERI U); the European Commission supported projects (including Adapting to Climate Change in Coastal Dar es Salaam and Climate Change and Urban Vulnerability) and the World Bank Urban Resilience programme.
<i>Submission of similar proposals under the same H2020-MSCA-ITN-2020 call</i>	Not submitted other similar proposals under the same H2020-MSCA-ITN-2020 call
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>• <b>Käyhkö, N., William, C., Mayunga, J., Makame, M.O., Mauya, E., Järvi, A., 2018.</b> Building geospatial competences in Tanzanian Universities with open source solutions. <i>The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Science</i>, 42-44, W8.</li> <li>• <b>Kombe, W., Namangaya, A., 2016.</b> Decentralisation and urban governance: trends and lessons from cities in Tanzania. In Gaesing, D.E., Inkoom, D., Kausel, T. (eds.) Decentralisation and regional development. Springer.</li> <li>• <b>Mwakapuja, F., Liwa, W., Kashaigili, J., 2013.</b> Usage of indices for extraction of built-up areas and vegetation features from landsat TM image: a case of Dar es Salaam and Kisarawe peri-urban areas, Tanzania. <i>International Journal of Agriculture and Forestry</i>, 3, 273-283.</li> <li>• <b>Namangaya, A., Kiunsi R., Lupala, J., Malele R., 2012.</b> Study on community initiatives in managing urbanization and risk accumulation processes: Lesson from Dar es Salaam, Tanzania. In Pelling, M., Wisner, B. (eds.) Disaster risk reduction: Cases from urban Africa. Routledge.</li> <li>• <b>Mayunga, J.S., 2009.</b> Measuring the measure: A multi-dimensional scale model to measure community disaster resilience in the US Gulf Coast region. Texas A&amp;M University.</li> </ul>

REVOLUTION – ETN

Beneficiary 10: Uppsala Universitet (UU)	
<i>General description</i>	Uppsala University (UU) is the Nordic region's oldest university, founded in 1477, and is ranked among the top 100 universities in the world. UU accommodates approximately 40,000 students, and the University's nearly 5,000 researchers and teachers conduct world-leading research and offer a seemingly endless number of courses, including 50 international Master's programmes. UU also has student exchange agreements with over 500 universities in 50 countries. The research work carried out at UU is conducted by faculties and research centres. Annually, it leads to an average of 360 PhD thesis and over 5,650 scientific publications. The Department of Earth Sciences hosts the Centre of Natural Hazards and Disaster Science (CNDS), which is a national platform for research on the nexus between socio-technical vulnerability and extreme events, will be participating in the project. The department and the centre contribute to improving the ability to prevent and deal with risks in society, both nationally and internationally, by raising awareness of the dynamics and consequences of natural hazards, considering the issue of vulnerability, as well as discussing crisis management.
<i>Role and commitment of key persons (incl supervisors)</i>	<b>Prof. Giuliano Di Baldassarre</b> (M) is Professor of Hydrology. He is an expert in human-nature interactions and disaster risk reduction. He is PI of the ERC project HydroSocialExtremes, and was the coordinator of the FP7 project KULTURisk (2011-2014). Prof. di Baldassarre is Director of the Centre of Natural Hazards and Disaster Science (CNDS). He is/has been supervisor of 14 PhDs. He is the main supervisor of ESR7 (5% fte). <b>Dr. Maurizio Mazzoleni</b> (M) is a researcher in socio-hydrology, with expertise in modelling human-water interactions with a focus on floods and droughts. He is/has been supervisor of 2 PhDs. He is co-supervisor to ESR7 (5% fte). <b>Dr. Johanna Mård</b> (F) is a researcher in hydrology, with expertise in water and climate, GIS and remote sensing. She teaches in natural hazards and disasters and human-environment interactions. She has much previous experience of leading climate impact assessments. She is Project Coordinator at Centre of Natural Hazards and Disaster Science (CNDS), and will embed the ESR within this structure.
<i>Key research facilities, infrastructures and equipment</i>	UU consists of nine faculties and stands out for its multiple areas of academic strength in which research, education and collaboration are integrally connected. UU have also built strategic research centres with a multidisciplinary holistic approach. Centre of Natural Hazards and Disaster Sciences (CNDS), one of the centres, is a national platform for research on the nexus between socio-technical vulnerability and extreme events and will together with its partner organisations participate in the proposed project. UU further offers access to local and national supercomputing equipment (UPPMAX) and expertise to perform and access earth system models and complex geophysical data.
<i>Status of research premises</i>	Research facilities are owned by UU and are independent from other beneficiaries and/or partner organisations in the consortium.
<i>Previous involvement in research and training programmes, including ITN</i>	UU has participated in close to 300 European research projects (FP7, H2020), including 23 ITNs. Some of these have been co-ordinated at UU (e.g. MATCON). Key persons for REVOLUTION have been involved in, amongst others: BONUS funded Baltic-C and INTEGRAL, FU FP6 PEP in Baltic, Marie-Curie ITN MODOBS, COST action 735, SVALI Nordic Network. Marie-Curie ITN NSINK (Research and Training). Moreover, Giuliano Di Baldassarre and Johanna Mård are the main organizer of the EGU/CNDS summer school on "Natural Hazards in the Anthropocene" (2018, 2019, 2020) aiming at PhD training PhD students.
<i>Current involvement in research and training programmes, including ITN</i>	UU is currently involved in close to 120 ongoing projects within Horizon 2020, including 25 MSCAs and 20 ERC grants. ITNs co-ordinated by UU include Nu-Spine, awarded in 2018. Besides the aforementioned EGU/CNDS summer school, Giuliano Di Baldassarre is the PI of the ERC Consolidator Grant HydroSocial Extremes. Moreover, Johanna Mård and Maurizio Mazzoleni are actively involved in the undergraduate and post-graduate teaching and research training in Earth Sciences at UU.
<i>Submission of similar proposals under the same H2020-MSCA-ITN-2020 call</i>	Not submitted other similar proposals under the same H2020-MSCA-ITN-2020 call.
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>• <b>Di Baldassarre, G.</b>, Sivapalan, M., Rusca, M., Cudenneq, C., Garcia, M., Kreibich, H., et al., 2019. Sociohydrology: Scientific challenges in addressing the sustainable development goals. <i>Water Resour. Res.</i>, 55, 6327-6355</li> <li>• Nardi, F., Annis, A., <b>Di Baldassarre, G.</b>, E.R. Vivoni, and S. Grimaldi, 2019. GFPLAIN250m, a global high-resolution dataset of Earth's floodplains. <i>Scientific Data</i>, 6, 180309</li> <li>• <b>Di Baldassarre, G.</b>, Wanders, N., AghaKouchak, A., Kuil, L., Ramecroft, S., Veldkamp, T.I.E., Garcia, M., Van Oel, P.R., Breinl, K., Van Loon A.F., 2018. Water shortages worsened by reservoir effects. <i>Nature Sustainability</i>, 1, 617-622</li> <li>• <b>Di Baldassarre, G.</b>, Nohrstedt, D., <b>Mård, J.</b>, Burchardt, S., Albin, C., et al., 2018. An integrative research framework to unravel the interplay of natural hazards and vulnerabilities, <i>Earth's Future</i>, 6, 305-310</li> <li>• <b>Mård, J.</b>, <b>Di Baldassarre, G.</b>, <b>Mazzoleni, M.</b> (2018) Nighttime light data reveal how flood protection shapes human proximity to rivers. <i>Science Advances</i>, 4, eaar5779.</li> </ul>



5.2 Partner organisations

Partner 1: FloodTags (FTags)	
<i>General description</i>	FloodTags (FTags) analyses online media and user-generated content for water management and food security. Data sources include online news articles, blogs, forums, Twitter, Facebook public pages, and we connect to messengers such as WhatsApp and Telegram. We analyse these sources by using a mix of artificial intelligence, natural language processing, and combinations with external data sources, including satellite imagery. Applications comprise real-time and historic (trend) analysis for emergency flood response, water scarcity management, water conflict resolution, integrated water management, food security, and other water- and development related applications.
<i>Key persons and expertise</i>	<b>Mr. Jurjen Wagemaker</b> (M) is the founder and Director of FloodTags. He is an entrepreneur with more than 15 years on-the-ground experience in water management in Bangladesh, Bolivia, Cambodia, China, Hungary, India, Indonesia, Mozambique, Netherlands, Nepal, Philippines, Tanzania, Thailand, Uganda, and the USA. His expertise includes project management, information systems, data business models, and international aid and collaboration. He has an MSc in Civil Engineering from DUT. He is co-supervisor of ESR9 and 11 (5% fte). He has large experience in supervising staff, and is currently involved in the joint supervision of PhD students with several universities in the Netherlands, including VUA. <b>Erkan Basar</b> (M) is a computer scientist with a focus on computational linguistics. He works on textual event information processing, mainly on event information extraction. He has experience with supervision of research (MSc students). <b>Tom Brouwer</b> (M) is an expert in geospatial and text data analysis, Python back-end development, and water management. Erkan and Tom will be involved in technical supervision of part of the ESR work.
<i>Key research facilities, infrastructure and equipment</i>	FTags has an office in the Hague, the Netherlands, where the ESRs can spend their secondments. The ESRs also have access to their cloud infrastructure, the existing databases of online media data (e.g. 100s of millions of flood-related tweets collected since 2014 and newspaper archives) and scripts for the analysis of this data.
<i>Previous and current involvement in research and training programmes</i>	FTags has been leading and participated in a wide range of projects and is continuously supporting various applications of its software around the world. Examples include real-time flood hazard monitoring with the Philippines and assisting the Tanzanian Red Cross with community mapping. For this, FTags organised workshops and training events to co-design and teach its users how to best use the platforms.
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>• Global Flood Monitor: <a href="http://www.globalfloodmonitor.org">www.globalfloodmonitor.org</a></li> <li>• De Bruijn, J.A., <b>De Moel, H.</b>, Jongman, B., <b>De Ruiter, M.</b>, <b>Wagemaker, J.</b>, <b>Aerts, J.C.J.H.</b>, 2019. A global database of historic and real-time flood events based on social media. <i>Nature Scientific Data</i>, 6, 311</li> <li>• <b>Brouwer, T.</b>, Eilander, D., Van Loenen, A, Booij, M.J., Wijnberg, K.M., Verkade, J.S., <b>Wagemaker, J.</b>, 2017. Probabilistic flood extent estimates from social media flood observations. <i>Nat. Hazards Earth Syst. Sci.</i>, 17, 735-747</li> </ul>
Partner 2: Cloud to Street (C2S)	
<i>General description</i>	Cloud to Street (C2S) is the leading remote flood mapping and analytics system. Our technology is globally scalable and locally optimised for near real-time flood detection and analysing historic floods and flood patterns at a fraction of the time and cost of traditional methods. Founded by two female scientists in 2015 and designed specifically for scalable solutions, our research and systems have been used by national governments, the World Bank, German and French development agencies (GIZ and AFD), and others across 7 developing countries.
<i>Key persons and expertise</i>	<b>Dr. Beth Tellman</b> (F) is Chief Science Offer, and leads the science team and staff of C2S. She is a remote sensing scientist trained in hydrology and remote sensing of floods. She is co-supervisor of ESR11 (3% fte). She is experienced in supervising research staff, and currently oversees 5 full time science staff at C2S.
<i>Key research facilities, infrastructure and equipment</i>	C2S has office space in New York City, where the ESR can spend her/his secondment and gain access to data, code, and remote sensing platforms. This includes the world’s largest database of historic flood events maps, and proprietary flood detection algorithms that leverage multiple optical and radar sensors with an average global accuracy of over 85%. A close team of scientists is employed for scientific discussions and so forth.
<i>Previous and current involvement in research and training programmes</i>	Development of the Global Flood Database (GFD), in a collaborative project with the Dartmouth Flood Observatory, funded by Google Earth. Projects to improve flood hazard mapping using scalable solutions in many locations on Earth (e.g. Senegal, India, Egypt, Argentina) in collaboration with agencies including the World Bank, Water Partnership Program, Autoridad del Agua, and Nile Basin Initiative. These include the preparation, conduction, and evaluation of co-design workshops and users training events.
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>• <b>Tellman, B.</b>, Sullivan, J.S., 2019. Global flood observation with multiple satellites. In Wu, H. et al., (eds.) <i>Global Drought and Flood: Monitoring, Prediction, and Adaptation</i>. Wiley (in press)</li> <li>• Schwarz, B., Pestre, G., <b>Tellman, B.</b>, Sullivan, J., Kuhn, C., Mahtta, R., Pandey, B., Hammett, L., 2018. Mapping Floods and Assessing Flood Vulnerability for Disaster Decision-Making: A Case Study Remote Sensing Application in Senegal. In Mathieu, P.-P. &amp; Aubrecht, C. (eds.) <i>Earth Observation Open Science and Innovation</i>. Springer</li> <li>• <b>Tellman, B.</b>, Bausch, J.C., Eakin, H., Anderies, J.M., Mazari-Hiriat, M., Manuel-Navarette, D., Redman, C.L., 2018. Adaptive pathways and coupled infrastructure: seven centuries of adaptation to water risk and the production of vulnerability in Mexico City. <i>Ecol. Soc.</i>, 23, 1, doi.org/10.5751/ES-09712-230101</li> </ul>

REVOLUTION – ETN

Partner 3: UhuruLabs (ULabs)	
<i>General description</i>	Uhurulabs (ULabs) was founded in 2015, and is a company founded as a response to the gap perceived between the public, private and open(source/data/hardware), community. Its mission is to leverage technology and innovation for the development and benefit of Africa and its people. In doing so, its contributions to its vision of a world where Africa is an equal and fair beneficiary of its own resources and can take full advantage of technological advancements being made across the world.
<i>Key persons and expertise</i>	<b>Mr. Frederick Mbuya (F)</b> is the founder and Managing Director of ULabs. He has over 20 years working in technology both, in Africa and Europe. He is an experienced Director Of Information Technology with a demonstrated history of working in the information technology and services industry. He has strong information technology and professional skills in databases management, big data, Linux, and training. Over the past 4 years he has been heavily involved in drones and other disruptive technologies. He has large experience in professional training mentoring students from local universities. He is co-supervisor to ESR3 (3% fte).
<i>Key research facilities, infrastructure and equipment</i>	ULabs has office facilities providing the necessary working environment required for the ESR during the secondment period, and its own set of tools and services that can be used by the ESR.
<i>Previous and current involvement in research and training programmes</i>	ULabs has supported and worked with the Sickle Cell Research programme at the Muhimbili National Hospital for over 10 years, providing technical expertise and support. ULabs has also been responsible for mentoring students from local universities and training in topics as wide as UAV operations to Linux administration. Current project include the Building Drones project, in which Uhurulabs is working on building a multirotor drone entirely 3D printed and made in Tanzania; and the Lake Victoria Challenge, which aims to showcase advances in unmanned aerial technologies for social impact.
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>• <b>Mbuya, F.E.</b>, Rambaldi, G., Chaham, H.R., 2017. Drones: Can drones as an emerging disruptive technology help to realize the African Union Vision of a continent that is peaceful, integrated, people-centred and prosperous? The New Partnership for Africa's Development is the development agency of the African Union, Midrand, South Africa</li> <li>• World Bank. 2017. Guidance note : managing the risks of unmanned aircraft operations in development projects. World Bank, Washington DC</li> <li>• Mbuya, F., 2018. Drones over African skies. <a href="http://geoforum.fi/wp-content/uploads/2018/12/12-Frederick-Mbuya.pdf">http://geoforum.fi/wp-content/uploads/2018/12/12-Frederick-Mbuya.pdf</a></li> </ul>

Partner 4: United Kingdom Research and Innovation (UKRI)	
<i>General description</i>	The British Geological Survey (BGS) is a component body of the UKRI and is the UK's premier centre for earth science information and expertise. BGS is the component body that will be actively involved in REVOLUTION. It focuses on public-good science and research to understand earth and environmental processes. The Groundwater Science Directorate has 55 scientists working on hydrogeological monitoring, conceptualisation, risk assessment, environmental statistics, and climate impact science with a particular focus on groundwater extremes (droughts and floods).
<i>Key persons and expertise</i>	<b>Dr. John Paul Bloomfield (M)</b> is a Principal Hydrogeologist with more than 28 years' experience working on groundwater-related issues, in particular groundwater drought and environmental change. He has published over 50 peer-reviewed papers, and has large experience in collaborative projects with PhD students. For example, he is currently supervising 3 UKRI-funded PhD groundwater-related studentships. He is co-supervisor to ESR6 (3% fte). <b>Dr Laura Platt (F)</b> is BGS Science Grants and Studentships co-ordinator, and will provide practical and logistical support to the ESR prior to and during her/his secondment at UKRI.
<i>Key research facilities, infrastructure and equipment</i>	Access will be available to national groundwater level datasets and associated hydrogeological and geological metadata held by BGS (UKRI). The ESR will also have access to a range of groundwater modelling codes (both borehole and distributed modelling codes) and appropriate computing facilities to run the codes.
<i>Previous and current involvement in research and training programmes</i>	Dr. Bloomfield has led a number of work packages in the recently completed EC FP7-funded 'Managing aquatic ecosystems and resources under multiple stress' project (FP7 603378) and is currently co-ordinating BGS contributions to the RESOURCE EC-funded GeoERA ERA-net project ( <a href="http://geoera.eu/projects/resource/">http://geoera.eu/projects/resource/</a> ).
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>• Marchant, B.P., <b>Bloomfield, J.P.</b>, 2018. Spatio-temporal modelling of the status of groundwater droughts. <i>J. Hydrol.</i>, 564, 397-413</li> <li>• Lange, B., Holman, I., <b>Bloomfield, J.P.</b>, 2017. A framework for a joint hydro-meteorological-social analysis of drought. <i>Sci. Total Environ.</i>, 578, 297-306</li> <li>• <b>Bloomfield, J.P.</b>, Marchant, B.P., Bricker, S.H., Morgan, R.B., 2015. Regional analysis of groundwater droughts using hydrograph classification. <i>Hydrol. Earth Syst. Sc.</i>, 19, 4327-4344</li> </ul>

REVOLUTION – ETN

Partner 5: Confederacion Hidrografica del Júcar (CHJ)	
<i>General description</i>	The Júcar River Basin Authority (CHJ) is a Spanish River Basin Organisation. It is an entity with its own legal jurisdiction, affiliated with administrative effects to the Spanish Ministry of Ecological Transition, and has full functional autonomy, according to Spanish water laws. The Public Water Administration is exercised for the intercommunity river basins by the River Basin Authorities, and within the intra-community river basins by the corresponding Autonomous Hydraulic Community Administrations (regional government of a group of provinces) (article 16, Water Act). CHJ's duties are: (1) elaborating the Hydrologic River Basin Plan, as well as its reviews and follow-ups, in particular the Drought Management Plan; (2) management and control of the hydraulic public domain; (3) management and control of water uses; (4) developing projects, constructing and exploiting water infrastructures charged to the organisation's own funds, and constructing other public works entrusted by the government; and (5) developing other functions derived from agreements with autonomous communities, local corporations, and other private or public entities.
<i>Key persons and expertise</i>	<b>Dr Teodoro Estrela (M)</b> is a Doctor in Civil Engineering of the Universitat Politècnica de València. Currently, he is Director of Water Planning in the CHJ and Associate Professor of the Universitat Politècnica de València. He is Permanent Secretary of the Mediterranean Network of Basin Organisations and Vice-President and Chairman of Standing Committee on Water of World Council of Civil Engineers, as well as member of OECD Water Governance Initiative. From 2005 to 2009, he has been Deputy Water Director on Water Planning of the Spanish Ministry of Environment and Rural and Marine Affairs, being in charge of the implementation of Water Framework Directive in Spain. He has occupied different positions during 16 years in the Centre for Hydrographic Studies in Madrid, the latest as Technical and Scientific Coordinator of the Hydrology Department. During this period, he was a member of the European Topic Centre on Inland Waters of the European Environment Agency. He is author of numerous publications about water issues in different scientific journals and books. He is has/been supervisor to 5 PhDs. He will co-supervise ESR7 (3% fte). <b>Ms. Laura Tanco Ballesteros</b> is Head of Technical Service at the CHJ Planning Office. She is a civil engineer and graduate in environmental sciences from the Universitat Politècnica de València, She has collaborated in the revision of the Drought Management Plan and is responsible for the monthly follow-up of the drought indicators. Since 2018, she collaborates with the Permanent Technical Secretariat of the Mediterranean Network of Basin Organisations (MENBO), as a Technical Expert and consequently she has taken part in different international events as a speaker.
<i>Key research facilities, infrastructure and equipment</i>	Access will be available to the IT infrastructure of CHJ. The ESR will focus on drought management and will be given access to the specific tools developed by the CHJ, namely the hydrological simulation models and the hydrological indicators system.
<i>Previous and current involvement in research and training programmes</i>	CHJ has been involved in many projects related to water management, including: a European Commission DG-Environment commissioned peer-review mechanism for the implementation of the Water Framework Directive (ENV.C.1/SER/2014/0005); the Copernicus funded EDGE project, an end-to-end Demonstrator for improved decision-making in the water sector in Europe; the Twinning with Morocco project, including training and support to the Kingdom of Morocco to strengthen their institutional, organisational and technical capacities in governance and integrated water resources management; and the LIFE-CC funded project MediPlan, which integrated climate change adaptation measures in the Water Framework Directive Plans in the Mediterranean area.
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>• <b>Estrela, T.,</b> Sancho, T., 2016. Drought management policies in Spain and the European Union: from traditional emergency actions to Drought Management Plans. <i>Water Policy</i>, 18, 153-176</li> <li>• Pedro-Monzonis, M., <b>Estrela, T.</b> et al., 2015. A review of water scarcity and drought indexes in water resources planning and management. <i>J. Hydrol.</i>, 527, 482-493</li> <li>• <b>Estrela, T.,</b> Vargas, E., 2012. Drought Management Plans in the European Union. The Case of Spain. <i>Water Resour. Manag.</i>, 26 1537-1553</li> </ul>

Partner 6: National Aeronautics and Space Administration (NASA)	
<i>General description</i>	The National Aeronautics and Space Administration (NASA) Applied Sciences Program, which falls within NASA's Earth Science Division, funds projects that enable innovative uses of NASA Earth science data in organisations' policy, business, and management decisions. The project results and enhanced decision making improve the quality of life and strengthen the economy.
<i>Key persons and expertise</i>	<b>Dr. Shanna McClain (F)</b> is the Program Lead for Risk Reduction and Resilience with NASA's Disasters program. Her work involves defining NASA's role in resilience through the development of risk reduction-based projects in fragile and crisis-affected areas, and by identifying opportunities to integrate Earth observation data into humanitarian action for improved understanding and management of risk. She will co-supervise ESR15 (3% fte). <b>Dr. David Green (M)</b> is the program manager for NASA's Disaster Applications Program. David and his team use space-based instruments and models to support decisions and actions, promote innovation, and build capacity in the use of Earth Science. He also serves on the Committee on Earth Observation Satellites (CEOS) and Group on Earth Observation (GEO) Disasters Working Groups. Dr. Green is a highly experienced supervisor of young researchers. He will co-supervise ESR14 (3% fte).
<i>Key research facilities, infrastructure and equipment</i>	NASA Goddard Space Flight Center is located near Washington D.C. The Earth Sciences Division develops and operates remote-sensing satellites and instruments. It also analyses observational data from these spacecrafts and makes it available to the world's scientists. Its missions are supported by hundreds of scientists.
<i>Previous and current involvement in research and training programmes</i>	The NASA Disasters Program promotes the use of Earth observations to improve the prediction of, preparation for, response to, and recovery from natural and technological disasters. By sponsoring application science, the Program advances the readiness of results to enable disaster management practices, advance damage reduction, and build resilience. Now, each year ARSET trains over 6500 individuals representing more than 2500 organisations. It also carries out a large amount of applied research related to disaster mapping and risk reduction, for example recent and ongoing projects include: Developing Global Building Exposure for Disaster Forecasting, Mitigation and Response, Enhancing Floodplain Management in the Lower Mekong River Basin Using NASA Vegetation and Water Cycle Satellite Observations; Mapping of Flood Extent and Flood Losses from Satellite-Based Data; and InSAR Volcano Monitoring.
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>• Advanced and introductory webinar series for researchers and professionals engaged in applied environmental management (<a href="https://arset.gsfc.nasa.gov/webinars">https://arset.gsfc.nasa.gov/webinars</a>)</li> <li>• Schumann, G.J.-P., <b>Green, D.</b> et al., 2016.Unlocking the full potential of Earth observation during the 2015 Texas flood disaster. <i>Water Resour. Res.</i>, 52, 3288-3293</li> <li>• Rose, R.A., Prados, A. et al., 2015. Ten ways remote sensing can contribute to conservation. <i>Conserv. Biol.</i>, 29, 350-359</li> </ul>

## REVOLUTION – ETN

Partner 7: JRC -Joint Research Centre- European Commission (JRC)	
<i>General description</i>	The Disaster Risk Management Unit of the European Commission Joint Research Centre (JRC) has the mission to strengthen the EU's resilience to crises and disasters and to help implement the EU's aim to promote stability and peace through its research in crisis management technologies as well as in information mining and analysis. The Unit also focuses on integrated systems applied to a number of areas, e.g. risk analysis, situational awareness, early warning, collaborative decision-making in crisis room environments, media monitoring, and external aid spending and donor coordination. We work both on risk and prevention as well as preparedness and response, for floods and droughts. The 2 groups that will be directly involved in REVOLUTION develop flood and drought early warning systems contributing to the Copernicus Emergency Management System. In the framework of REVOLUTION, we are interested in developing real-time forecasting of flood impacts, global flood mapping, and monitoring of European groundwater droughts.
<i>Key persons and expertise</i>	<b>Dr. Paulo Barbosa</b> (M) is Team Leader for Climate Adaptation and Droughts at JRC and supervises a group of staff in the order of 10-15 people, having had extensive experience supervising PhD and Post-doc researchers at the JRC in the last 15 years. He will co-supervise ESR6 and 8 (5% fte). <b>Dr. Peter Salamon</b> (M) is the Team Leader for floods at JRC and supervises a group of staff in the order of 10-15 people. He has extensive experience supervising PhDs and Post-docs at JRC in the last 15 years. He will co-supervise ESR5 (3% fte).
<i>Key research facilities, infrastructure and equipment</i>	The Disaster Risk Management Unit is based in Ispra (Italy) at the main JRC site, where more than 2000 people are currently working on different research topics. The Unit has around 60 staff members and 60 IT consultants and can provide a suitable environment for training and transfer of knowledge to ESRs. JRC also has computing clusters and supercomputing facilities on site that will be available to the ESRs.
<i>Previous and current involvement in research and training programmes</i>	Being part of the EC, JRC currently has a selective participation in EU research and training projects but it has worked in several natural hazards research projects in different EU Framework Programmes (e.g. EuroGEOSS, DEWFORA, HELIX, ANYWHERE, I-REACT, KULTURISK, IMPREX).
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>• Data and decision-support platforms, such as: European Drought Observatory: <a href="http://edo.jrc.ec.europa.eu">http://edo.jrc.ec.europa.eu</a>; Global Flood Awareness System: <a href="http://www.globalfloods.eu">www.globalfloods.eu</a>; Copernicus Emergency Management Service: <a href="http://emergency.copernicus.eu/">http://emergency.copernicus.eu/</a></li> <li>• Naumann, G., Carrão, H., <b>Barbosa, P.</b>, 2019. Indicators of social vulnerability to drought. In Iglesias, A. et al. (eds.) Drought: Science and Policy. John Wiley and Sons Ltd</li> <li>• Feyera, A., Hirpa, F., <b>Salamon, P.</b>, Beck, H.E., Lorini, V., Alfieri, L., Zsoter, W., Dadson, S.J., 2018. Calibration of the Global Flood Awareness System (GloFAS) using daily streamflow data, <i>J. Hydrol.</i>, 566, 595-606</li> </ul>

Partner 8: Humanitarian OpenStreetMap Team US, Inc (HOT-OSM)	
<i>General description</i>	Humanitarian OpenStreetMap (HOT-OSM) is an international team dedicated to humanitarian action and community development through open mapping. We work together to provide map data which revolutionises disaster management, reduces risks, and contributes to achievement of the Sustainable Development Goals. HOT-OSM is involved locally, working in areas vulnerable to natural disaster, recovering after a disaster, or in economic transition. HOT-OSM tries to develop a local OpenStreetMap community and to create partnerships with local governments, researchers, and practitioners who can use and contribute to OpenStreetMap. These Initiatives on the ground include Dar es Salaam, Malawi, Togo, Senegal, Mongolia, Indonesia, and Haiti.
<i>Key persons and expertise</i>	<b>Mr. Tyler Radford</b> (M) is Executive Director of HOT-OSM, and also has oversight for the past 4 years on the implementation of the Ramani Huria flood-mapping and projections program, as part of the Tanzania Urban Resilience Project. As such, he plays an instrumental role in our engagement and co-design with stakeholders involved in community mapping in WP2. <b>Ivan Gayton</b> (M) is country manager for HOT-OSM Tanzania/Ramani Huria. He is a senior level humanitarian and technology professional with more than 15 years' experience in humanitarian and disaster contexts. He has ample experience in supervising staff, and will be co-supervisor to ESR1 (3% fte).
<i>Key research facilities, infrastructure and equipment</i>	HOT-OSM has served as the primary consultant for mapping for flood resilience in many countries and contexts and maintains a permanent team in Tanzania of 18 staff members, including graduates of ARU and University of Dar es Salaam.
<i>Previous and current involvement in research and training programmes</i>	HOT-OSM currently leads a large-scale initiative to conduct participatory mapping and data collection across Dar es Salaam. The mapping effort involves hundreds of local university students and partnerships with the Tanzania Red Cross to comprehensively map the entire flood-prone area of the city, capturing all key physical infrastructure. HOT-OSM collaborates on a USAID, Office of U.S. Foreign Disaster Assistance (OFDA) funded program together with other partners to support the Government of Indonesia's national disaster management agency. As part of the program, HOT-OSM designed and implemented an approach for comprehensively mapping key energy and drainage infrastructure as well as other facilities in Indonesia's two largest cities, Jakarta and Surabaya.
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>• Wagenaar, B.H., <b>Radford, T.</b>, et al., 2018. Developing a representative community health survey sampling frame using open-source remote satellite imagery in Mozambique. <i>Int. J. Health Geogr.</i>, 17, doi:10.1186/s12942-018-0158-4</li> <li>• Ospina, A.V. (2018) Big Data for resilience storybook: Experiences integrating Big Data into resilience programming. Winnipeg: International Institute for Sustainable Development – <i>inputs from HOT-OSM</i></li> <li>• Clark, C., Maron, M., Patel, D., <b>Radford, T.</b>, Soden, R., Uihol, P., 2016. Open Mapping for the Sustainable Development Goals. A practical guide to launching and growing open mapping initiatives at the national and local scales. Global Partnership for Sustainable Development Data, <a href="http://www.data4sdgs.org/resources/open-mapping-sdgs">http://www.data4sdgs.org/resources/open-mapping-sdgs</a></li> </ul>

REVOLUTION – ETN

Partner 9: Stichting Deltares (DRES)	
<i>General description</i>	Deltares (DRES) is an independent institute for applied research in the field of water, subsurface and infrastructure. Throughout the world, we work on smart solutions, innovations, and applications for people, environment, and society. Our main focus is on deltas, coastal regions, and river basins. Managing these densely populated and vulnerable areas is complex, which is why we work closely with governments, businesses, other research institutes, and universities at home and abroad. For DRES, the quality of our expertise and advice is foremost. Knowledge is our core business. DRES employs over 800 people and is based in Delft and Utrecht.
<i>Key persons and expertise</i>	The scientist in charge at DRES is <b>Dr. Hanneke van der Klis</b> (F). She is Director of Subsurface and Groundwater Systems and R&D Manager Enabling Technologies, under which the research activities in REVOLUTION will take place. <b>Dr. Gennadii Donchyts</b> (M) is an expert in software engineering, integrated environmental modelling, and remote sensing. He is highly experienced in the use of Google Earth Engine and in providing training on its usage in data analysis. At DRES, he has experience in supervising junior research staff, also in collaborative projects with PhD students. He will be co-supervisor of ESR2 and 13 (5% fte).
<i>Key research facilities, infrastructure and equipment</i>	DRES is one of five Grand Technological Institutes in the Netherlands. It hosts physical research facilities and laboratories for testing and analysis, next to state-of-the-art software development and application facilities to support model development. It has extensive in-house facilities for supercomputing and works extensively with Google Earth Engine.
<i>Previous and current involvement in research and training programmes</i>	DRES is and has been involved extensively in various H2020 projects, mainly focussing on river management, soil management, coastal zones, and geo-engineering. The following is a small selection of recently started and negotiated projects. DRES is currently involved in the Marie Skłodowska-Curie ITN project SYSTEM-RISK, in which it supervises several ESRs and contributes to training events. It led the recently completed FP7 earth2Observe project on remote sensing and water resource analysis. Other FP7/H2020 projects include: C-CASCADES, CREEP, GEOFLUID, RISES-AM. It has an extensive portfolio of research, training, and capacity building projects with international agencies ranging from governmental, NGOs, intergovernmental, and the private sector.
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>• Aqua Monitor (<a href="http://aqua-monitor.deltares.nl">http://aqua-monitor.deltares.nl</a>): web-based monitoring of Earth's surface water changes</li> <li>• <b>Donchyts, G.</b>, Baart, F., <b>Winsemius, H.</b>, Gorelick, N., Kwadijk, J., Van De Giesen, N., 2016. Earth's surface water change over the past 30 years. <i>Nat. Clim. Change</i>, 6, 810</li> <li>• <b>Donchyts, G.</b>, Schellekens, J., <b>Winsemius, H.</b>, Eisemann, E., Van de Giesen, N., 2016. A 30 m resolution surface water mask including estimation of positional and thematic differences using Landsat 8, SRTM and OpenStreetMap: a case study in the Murray-Darling Basin, Australia. <i>Remote Sensing</i>, 8, 386</li> </ul>

Partner 10: Barcelona Supercomputing Center - Centro Nacional de Supercomputacion (BSC-CNS)	
<i>General description</i>	Barcelona Supercomputing Center (BSC-CNS) combines high performance computing with research on computer, life, and Earth sciences, and computational applications, counting more than 700 researchers and students from more than 45 countries. BSC has been accredited since its first call (2011) as a Severo Ochoa Centre of Excellence. This award is given by the Spanish Government as recognition for leading research centres in Spain that are internationally well known institutions in their respective areas (only 11 research centres across the country). The Earth Sciences Department (BSC-ES) is a highly productive scientific entity that has published more than 240 articles in peer-reviewed journals over the last five years (2015-2019), some of them in prestigious high-impact journals. The Climate Prediction Group one of the four Research groups at the BSC-ES Department aims at developing a climate forecast system and performs regular assessments of the characteristics of this forecast system. BSC-CNS is one of the world leaders in the development of climate prediction and climate services.
<i>Key persons and expertise</i>	<b>Prof. Francisco J. Doblas-Reyes</b> (M) is director of BSC-ES. He is an expert in the development of seasonal-to-decadal climate prediction systems and has more than 20 years' experience in weather and climate modelling, climate prediction, and climate services. He serves on scientific panels of the World Climate Research Programme and World Weather Research Programme and has authored and co-authored more than 167 peer-reviewed papers. He is a member of the European Network for Earth System modelling HPC Task Force and has participated in numerous national and European FP4 and FP7 projects. He is involved in 4 H2020 Collaborative projects as Principal Investigator and has supervised or is currently supervising 4 Marie Skłodowska-Curie Individual Fellowships. He will co-supervise ESR10 (3% fte).
<i>Key research facilities, infrastructure and equipment</i>	BSC-CNS hosts and manages a range of high performance computing systems, including MareNostrum 4, with 148,176 cores and 13.7 PFlops capacity. Additionally, BSC-CNS manages Minotauro, a Sandy Bridge's cluster with NVIDIA GPUs, providing more than 100 TFlops.
<i>Previous and current involvement in research and training programmes</i>	BSC-CNS is a highly productive scientific body that has been granted 24 H2020 projects, 6 EU FP7 projects, 10 Copernicus contracts, 11 national projects and 22 national personal grants, and 4 ESA projects in the last 5 years. The most relevant H2020 projects for this proposal are: PRIMAVERA, MEDSCOPE, IMPREX, ERA-Net ERA4CS project EUCP: European Climate Prediction system; and SPECS (FP7). BSC-CNS is also beneficiary of the Marie Skłodowska-Curie Action COFUND program for postdoctoral fellows (STARS; H2020-MSCA-COFUND).
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>• Turco, M., Jerez, S., <b>Doblas-Reyes, F.J.</b>, AghaKouchak, A., Carmen Llasat, M., Provenzale, A., 2018. Skilful forecasting of global fire activity using seasonal climate predictions. <i>Nat. Commun.</i>, 9, 2718.</li> <li>• Ceglar, A., Toreti, A., Prodhomme, C., Zampieri, M., Turco, M., <b>Doblas-Reyes, F.J.</b>, 2018. Land-surface initialisation improves seasonal climate prediction skill for maize yield forecast. <i>Scientific Reports</i>, 8, 1322</li> <li>• Rodrigues, L.R.L., <b>Doblas-Reyes, F.J.</b>, Coelho, C.A.S., 2018. Calibration and combination of monthly near-surface temperature and precipitation predictions over Europe. <i>Clim. Dynam.</i>, doi:10.1007/s00382-018-4140-4</li> </ul>

REVOLUTION – ETN

Partner 11: United Nations International Strategy for Disaster Reduction (UNDRR)	
<i>General description</i>	The United Nations International Strategy for Disaster Reduction (UNDRR) is mandated by United Nations (UN) General Assembly resolution 56/195 to serve as focal point in the UN system for the coordination of disaster reduction and to ensure synergies among the disaster reduction activities of the UN system and regional organisations and activities in socio-economic and humanitarian fields. UNDRR is the custodian agency of the Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework) and has been tasked by the UN General Assembly to support its implementation, follow-up, and review. It supports countries and other stakeholders in understanding and managing risk, and will track progress in implementing the 7 targets of the Sendai Framework as well as its related dimensions reflected in the Sustainable Development Goals 1, 11 and 13. UNDRR is involved in training and supporting governments to develop disaster loss databases and national loss accounting systems. It supports countries in further developing DRR Plans/strategies at national and local levels. The UNDRR Branch Supporting Analysis and Monitoring of Sendai Framework Implementation (SAMSFI) provides technical support on emerging knowledge on risk and its management, and is tasked with developing a new cadre of professionals in DRR and climate change adaptation.
<i>Key persons and expertise</i>	<b>Mr. Marc Gordon</b> (M) leads the Sendai Monitoring Unit. His work is focused on monitoring the implementation of the Sendai Framework. <b>Mr. Adam Fysh</b> (M) is Programme Management Officer Risk Analysis and Reporting. Both Mr. Gordon and Mr. Fysh are key staff on in the Global Risk Assessment Framework (GRAF), in which the activities of WP4 are embedded. They will ensure that the ESR projects are linked to the GRAF and contribute to organising WP4 research workshops. Moreover, they are responsible for the Global Assessment Report (GAR), to which the ESR's work can contribute. <b>Mr. Julio Serje</b> (M) is expert on Disaster Loss Databases and <b>Mr. Sanjaya Bhattia</b> (M) is experienced in education and training on DRR. They will contribute to the network-wide training events, as summarised in Table 1.2c.
<i>Key research facilities, infrastructure and equipment</i>	As a UN entity, UNDRR has access to the infrastructure and facilities managed by the United Nations System. In addition, UNDRR has a dedicated Global Education Training Institute, supported by the Ministry of the Interior and Safety (MOIS) of the Government of the Republic of Korea and the Incheon Metropolitan City.
<i>Previous and current involvement in research and training programmes</i>	UNDRR has been involved in many research and training projects with EU and other partners, including: (1) UNDRR biannual Global Assessment Reports (based on the inputs from a large body of original research by a wide range of independent scientific institutions, think tanks, UN agencies, governments, non-governmental organisations and businesses); (2) the Global Risk Assessment Framework (a scientific and social movement to transform how people around the world understand and act on risk and responsibility in order to meet the Sendai targets); (3) training of DRR stakeholders through its Global Education Training Institute in Incheon (to date UNDRR has trained more than 3000+ DRR stakeholders); (4) support and capacity building for the development of Disaster Loss Databases in 90+ countries; (5) many projects focused on capacity building, technical support, and research in the countries through its five regional, two sub-regional, and two liaison offices; (6) convening several networks, including the Science and Technology Advisory Group at global and regional levels as well as coordinating with other academic, scientific and technology research entities and networks.
<i>Relevant publications and/or research / innovation products</i>	<ul style="list-style-type: none"> <li>● Global Risk Assessment Framework – to be launched in 2019</li> <li>● UNDRR, 2015. Sendai Framework for Disaster Risk Reduction 2015-2030. UNDRR, Geneva</li> <li>● UNDRR, 2009, 2011, 2013, 2015. Global Assessment Report. UNDRR, Geneva</li> </ul>

## 6 Ethical Issues

### 6.1 European and national legal and ethics requirements

As indicated in the Ethical Issues Table (part A) this project includes **research that involves human participants and research involving personal data collection and/or processing**. Specifically, it involves collection and processing of personal data from human participants (volunteers for social sciences research; adults). We are not aware of and do not expect any potentially critical ethical implications of the research results. However, the partners in the REVOLUTION consortium will comply with the European Legal Framework and will apply its ethical standards and guidelines. Furthermore, the consortium will comply to relevant EU legislation, including:

- The Declaration of Helsinki in its latest version;
- The Charter of Fundamental Rights of the EU (2000/C 364/01);
- EU regulation 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data.

Furthermore, the consortium will ensure continuing compliance and will take into account relevant revisions to the mentioned legislation and directives. **Each partner will be held responsible for fulfilment of all legal and ethical requirements in their country.**

The Executive Board will discuss any ethical issues arising from the project. If warranted by national legislation, protocols that are used in the network need to be submitted to and approved by local ethics review committees. All WP leaders need to deliver the approval to the Project Office to enable adequate registration and monitoring. All procedures at the very least comply with international guidelines and with current national legislations.

### 6.2 Specific ethics issues

#### 6.2.1 Human beings

Human participants will be involved in some elements of the research. Participation will be voluntary at all times and our procedures will ensure that informed consent is recorded. The research will not involve any physical, financial, social, or legal risk to participants, and potential psychological risks will not exceed the daily life standard.

##### ▪ *Study setup involving human participants*

Many ESRs (1,2,4,5,7,15) will include some data collection with the direct participation of human participants. Methods include surveys, qualitative interviews, focus groups, workshops, participatory GIS, and observation. Some further projects also include the use of secondary data generated by people, e.g. volunteered GIS and social media; and discussions with stakeholders for the co-development of management interventions. Discussions with stakeholders (focus groups/workshops), will also take place within WPs 2-4 during the research workshops at WP level.

##### ▪ *Recruitment*

Only adult volunteers will be allowed to participate in the research. Recruitment may be by means of email, letter, or through personal recommendations and contacts, whilst complying with EU regulation 2016/679 regarding the use of personal information.

##### *Informed consent*

Potential participants will be provided with a written participant information sheet (translated where necessary) that, in layman's terms, fully explains the purpose of the project, the nature of their involvement, any potential discomforts, what happens to the data and their right to access it, procedures around confidentiality and anonymity, and gives contact details of researchers and supervisors. It will clearly state that participation is voluntary, and terms of their right to withdraw. Participants will be asked to sign a consent form which may include separate items for any specific consents relating to, for example, use of quotations, use of images, and agreement to anonymised data being open access. Ongoing verbal consent will be sought and recorded where written consent is not appropriate.

##### *Withdrawal*

Participants are free to withdraw at any point from this study. Details of withdrawal will be provided in the participant information sheet and mentioned in the consent form. They will also be reminded that there are no consequences for withdrawing from the study. Participants will not have to give a reason to withdraw from the study. If they have already participated with part of the data collection, they will also have the option to have this data removed from the study and destroyed. This extends to two weeks beyond each phase of data collection if any participant decides they would like to withdraw their data from the study.

### 6.2.2 *Personal data*

For the purpose of this project, it is necessary to work with personal information of human beings as described in Section 6.2.1. We will participate in the open access to research data pilot of article 29.3 of the model Grant Agreement and will facilitate access to anonymised and aggregated forms of data on request, consents allowing.

- *Data collection, processing and storage*

For collection and processing of personal data, we will abide with EU legislation with regard to personal data. All partners involved in the collection and processing of personal data will be required to present their own data management plan before starting their data collection. Personal data will be stored on secure servers with encryption, through use of University systems. Data sharing will take place by means of secure interfaces of such systems. Where it is not possible to upload data immediately to a secure server, e.g. when collecting data in the field with no internet access, data will be stored on encrypted drives as a temporary measure. Names and contact details, where it is necessary to retain them, will be kept separately from data such as interview transcripts. Anonymisation will take place at the earliest appropriate stage of research. However, not all data can be truly anonymised in the sense of making it untraceable back to an individual (e.g. interview data). We will ensure however that individuals are not identifiable in outputs, or in any data archived for open access, unless explicit consent has been given for anonymity to be waived (e.g. in the case of highly specific stakeholders) and individuals are aware of any risks of non-anonymity. Appropriate measures will be taken to prevent unauthorised use of study information. For example, at the VUA we have a dedicated University Data Protection Officer, Mrs. Susanne Visscher, LL.M ([s.a.n.visscher@vu.nl](mailto:s.a.n.visscher@vu.nl)).

- *Informed consent (specific issues)*

Informed consent for the collection and processing of personal data will be obtained from all participants taking part in research carried out in REVOLUTION (also see the section 6.2.1 on Human beings above).

### 6.2.3 *Non-EU countries*

REVOLUTION involves a beneficiary organisation from Tanzania and partner organisations from the United States of America and Tanzania. One of the research WPs (WP2) focuses on flood risk in Dar es Salaam (Tanzania). Inclusion of the Tanzanian University ARU as full beneficiary supports the strategic priorities of the **Abidjan Declaration**<sup>37</sup> of the **Joint Africa-EU Strategy**, in particular by encouraging mobility of researchers for skills and knowledge development. By holding a Milestone Training Event in Dar es Salaam, all ESRs will gain experience in working in the Global South.

- *Research activities in non-EU countries*

Regardless of the country in which the research is carried out, ethical standards and guidelines of Horizon 2020 will be rigorously applied. The research conducted in Tanzania and the United States of America is compatible with European and international law. Ethical issues are addressed in the same way as described in Sections 6.2.1 and 6.2.2. Data collected will be stored on secure servers at the beneficiaries and partners in the EU.

Especially for the work in Tanzania, we will adhere carefully to the principles laid out in the Declaration of Helsinki and the Global Code of Conduct for Research in Resource-Poor Settings. The senior staff of REVOLUTION involved in this WP are accustomed to following these principles and have worked successfully with communities and stakeholders in developing countries in recent and ongoing research projects and in previous roles. We will also draw on the local knowledge of RC and local Red Cross offices, who have much experience working in development settings and have worked for a long time in the regions studied in the project. We are aware that **informed consent** might need to be organised differently in some development contexts if participants do not speak English and cannot read the consent form. Recorded verbal consent will be used in these cases and a research assistant speaking the local language will explain the project and conditions described above.

---

<sup>37</sup> AU and EU, 2017. Investing in Youth for Accelerated Inclusive Growth and Sustainable Development. AU-EU/Decl.1(V). AU/EU, Abidjan



## 7 Letters of Commitment



**FLOODTAGS**  
KvK Nr. 59502622  
Binckhorstlaan 36, M2.11  
2516 BE The Hague  
The Netherlands  
[www.floodtags.com](http://www.floodtags.com)

The Hague, October 10th, 2019

## To whom it may concern

I undersigned Jurjen Wagemaker, in my quality of Director of FloodTags, commit to set up all necessary provisions to participate as partner organisation in the proposal REVOLUTION ('A new generation of REsearchers to reVOLutionise sustainable flood and drought risk soluTIONS') submitted within the call H2020-MSCA-ITN-2020 should the proposal be funded.

On behalf of FloodTags, I also confirm that we will participate and contribute to the research, innovation and training activities as planned in this project. In particular, our FloodTags will be involved in the provision of secondments to Early Stage Researchers (ESRs), their co-supervision, and an active contribution to the training activities and stakeholder workshops.

I hereby declare that I am entitled to commit into this process the entity I represent.

Kind regards,

A handwritten signature in blue ink, appearing to be "Jurjen Wagemaker", written over a horizontal line.

Jurjen Wagemaker  
10 October 2019



# Cloud to Street

Cloud to Street

+1-973-493-5647 Brooklyn, NY, USA [Support@CloudtoStreet.info](mailto:Support@CloudtoStreet.info) [CloudtoStreet.info](http://CloudtoStreet.info)

Re: LETTER OF COMMITMENT REVOLUTION PROPOSAL

To whom it may concern,

I undersigned Beth Tellman, in my quality of Chief Science Officer at Cloud to Street, commit to set up all necessary provisions to participate as partner organisation in the proposal REVOLUTION ('A new generation of REsearchers to reVOLutionise sustainable flood and drought risk soluTIONS') submitted within the call H2020-MSCA-ITN-2020 should the proposal be funded.

On behalf of Cloud to Street, I also confirm that we will participate and contribute to the research, innovation and training activities as planned in this project. In particular, Cloud to Street will be involved in the provision of secondments to Early Stage Researchers (ESRs), involvement in their co-supervision, and an active contribution to the training activities and stakeholder workshops. I hereby declare that I am entitled to commit into this process the entity I represent.

We look forward to training the next generation of flood scientists in cutting edge methods in big data and remote sensing to tackle the toughest problems in flood vulnerability.

Kind regards,

Beth Tellman *Beth Tellman*

October 10 2019



... technology for the motherland ...

Nov 29, 2019

**Re: COMMITMENT LETTER FOR REVOLUTION PROPOSAL**

To whom it may concern,

I undersigned Frederick Mbuya, in my quality of Director of Uhuru Labs Tanzania, commit to set up all necessary provisions to participate as partner organisation in the proposal REVOLUTION ('A new generation of REsearchers to reVOLutionise sustainable flood and drought risk soluTIONs') submitted within the call H2020-MSCA-ITN-2020 should the proposal be funded.

On behalf of Uhurulabs, I also confirm that we will participate and contribute to the research, innovation and training activities as planned in this project. In particular, Uhurulabs will be involved in the provision of secondments to Early Stage Researchers (ESRs), that perform research on the use of novel observation methods for river flows and solid waste mobilization within the context of flood risks in Dar es Salaam. Uhurulabs will be involved in their co-supervision and provide an active contribution to the training activities and stakeholder workshops. Training activities by Uhurulabs will particularly relate to the use of various platforms for the collection of real world data including drones, smartphones with a special focus on leveraging opensource and openhardware.

I hereby declare that I am entitled to commit into this process the entity I represent.

Uhurulabs sees great value in REVOLUTION as we see a great need to improve our abilities to collect and analyse new kinds of data for disaster management, and link this to actual problem cases on the ground.



29 November 2019

# UK Research and Innovation

To Whom it May Concern

17<sup>th</sup> September 2019

Environmental Science Centre  
Keyworth  
Nottingham NG12 5GG  
United kingdom

Telephone 0115 936 3331  
E-mail chto@bgs.ac.uk

Re: COMMITMENT LETTER FOR REVOLUTION PROPOSAL

To whom it may concern

I undersigned Christopher Luton, in my position as Head Intellectual Property and Legal Services at British Geological Survey (BGS), a component institute of UK Research and Innovation (UKRI), commit to set up all necessary provisions to participate as a partner organisation in the proposal REVOLUTION ('A new generation of REsearchers to reVOLutionise sustainable flood and drought risk soluTIONS') submitted within the call H2020-MSCA-ITN-2020 should the proposal be funded.

On behalf of United Kingdom Research and Innovation (UKRI), I also confirm that we will participate and contribute to the research, innovation and training activities as planned in this project. In particular, Dr John Bloomfield, British Geological Survey, will be involved in the provision of secondments to Early Stage Researchers (ESRs), involvement in their co-supervision, and an active contribution to the training activities and stakeholder workshops.

I hereby declare that I have the capacity to commit UKRI/BGS. A body I represent, into this process. We believe that this is a vital opportunity to create a key researcher network. In particular, for BGS working with the University of Freiburg on the co-supervision of a student on groundwater resources will enable us to deepen and wider European research capabilities related to drought assessment, modelling and prediction. We wish the coordinator the best of luck for the proposal – a key challenge for the European environmental science community.

Kind regards,



Christopher Luton  
Head of Intellectual Property and Legal Services



Valencia, 18th December 2019

Re: COMMITMENT LETTER FOR REVOLUTION PROPOSAL

To whom it may concern,

I undersigned Manuel Ignacio Alcalde Sánchez, in my quality of President of the *Confederación Hidrográfica del Júcar*, commit to set up all necessary provisions to participate as partner organisation in the proposal REVOLUTION ('A new generation of REsearchers to reVOLutionise sustainable flood and drought risk soluTIONs') submitted within the call H2020-MSCA-ITN-2020 should the proposal be funded.

On behalf of *Confederación Hidrográfica del Júcar*, I also confirm that we will participate and contribute to the research, innovation and training activities as planned in this project. In particular, our *Confederación Hidrográfica del Júcar* will be involved in the provision of secondments to Early Stage Researchers (ESRs), involvement in their co-supervision, and an active contribution to the training activities and stakeholder workshops.

I hereby declare that I am entitled to commit into this process the entity I represent.

Kind regards,

Manuel Ignacio Alcalde Sánchez  
18/12/2019

National Aeronautics and  
Space Administration  
**Headquarters**  
Washington, DC 20546-0001



Date October 20, 2019

Instituut voor Milieuvraagstukken (IVM) – Institute for Environmental Studies  
Vrije Universiteit Amsterdam  
De Boelelaan 1087, 1081 HV Amsterdam, The Netherlands

Re: COMMITMENT LETTER FOR REVOLUTION PROPOSAL

To whom it may concern,

I undersigned Dr. David S. Green, in my quality as Program Manager in NASA Earth Science Division, Application Science Program for Disaster Risk Reduction & Resilience, commit to set up all necessary provisions to participate as partner organisation in the proposal REVOLUTION ('A new generation of REsearchers to reVOLutionise sustainable flood and drought risk soluTIONS') submitted within the call H2020-MSCA-ITN-2020 should the proposal be funded.

On behalf of National Aeronautics and Space Administration (NASA), I also confirm that we will participate and contribute to the research, innovation and training activities as planned in this project. In particular, NASA will be involved in training and developing a network of a new generation Early Stage Researchers to contribute to monitoring flood risk and drought-related targets of international agreements such as the Sendai Framework. This will be achievable by using innovative and geographically scalable data and approaches. NASA supports the collection, storage, dissemination and use of free and open Earth observations and the applications for societal benefit consistent with the priority of the proposed project.

I hereby declare that I am entitled to commit into this process the entity I represent.

I anticipate that REVOLUTION will increase decision-makers' access to and sharing of Earth observation products and will serve to support and enhance efforts to understand local, regional, national and global extreme water processes. The project complements NASA's experience in establishing collaborative networks around flood and drought issues. In particular, these networks are consistent with implementation of the Sendai targets through the Group on Earth Observation GEO Global Flood Risk Monitoring Community Activity. As a Partner Organization in the Marie Skłodowska-Curie ETN network, NASA's intention is to participate actively in the project on a best effort basis, should it be retained for funding.

Kind regards,

David S. Green, PhD

October 20, 2019

A handwritten signature in black ink that reads "David A Green". The signature is written in a cursive style and is positioned above a thin yellow horizontal line.



EUROPEAN COMMISSION  
JOINT RESEARCH CENTRE

Directorate E - Space, Security and Migration (Ispra)  
The Director

Ispra, 3 December 2019

## TO WHOM IT MAY CONCERN

**Subject: Commitment letter for REVOLUTION proposal,**

I undersigned Dan Chirondojan, in my quality of Director of the Space, Security and Migration Directorate of the Joint Research Centre, commit to set up all necessary provisions to participate as partner organisation in the proposal REVOLUTION ('A new generation of REsearchers to reVOLutionise sustainable flood and drought risk soluTIONs') submitted within the call H2020-MSCA-ITN-2020 should the proposal be funded.

On behalf of JRC-Joint Research Centre-European Commission, I also confirm that we will participate and contribute to the research, innovation and training activities as planned in this project. In particular, our Directorate E- Space, Security and Migration will be involved in:

1. Contribute to the project by hosting Early Stage Researchers as non-paid visiting scientists and involvement in their co-supervision.
2. Contribute to the training activities and stakeholder workshops.

The JRC intends to discuss further details of its support with the REVOLUTION consortium partners and other services of the European Commission, provided that the project is approved. We recognise the importance of this project for the JRC in further developing its activities in the fields of Disaster Risk management.

In further discussions, the following person will act as the JRC-Directorate E contact:

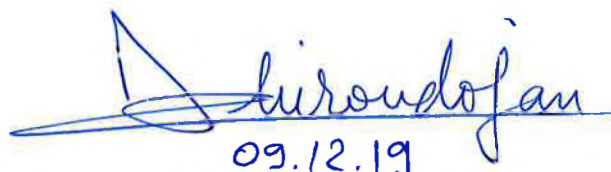
Paulo Barbosa  
European Commission  
Joint Research Centre - Directorate E  
Unit-E.1  
TP 167  
e-mail address: paulo.barbosa@ec.europa.eu



This Letter of Commitment does not create any financial and legal obligations on part of the JRC. There will be no exchange of funds between the JRC and the consortium.

I hereby declare that I am entitled to commit into this process the entity I represent.

Kind regards,

A handwritten signature in blue ink, appearing to read "Chirondojan", with a date "09.12.19" written below it.

Dan CHIRONDOJAN



Humanitarian  
OpenStreetMap  
Team

1110 Vermont Avenue NW, Suite 500  
Washington, DC 20005 USA  
info@hotosm.org  
www.hotosm.org

Re: COMMITMENT LETTER FOR REVOLUTION PROPOSAL

To whom it may concern,

I undersigned Paul Uithol, in my quality of Director of Programs of the Humanitarian OpenStreetMap Team United State's Inc. (HOT-OSM), commit to set up all necessary provisions to participate as partner organisation in the proposal REVOLUTION ('A new generation of REsearchers to reVOLutionise sustainable flood and drought risk solUTIOns') submitted within the call H2020-MSCA-ITN-2020 should the proposal be funded.

On behalf of the Executive Director of the Humanitarian OpenStreetMap Team United State's Inc., I also confirm that we will participate and contribute to the research, innovation and training activities as planned in this project. In particular, our Executive Director of Humanitarian OpenStreetMap Team United State's Inc. will be involved in the provision of secondments to Early Stage Researchers (ESRs), involvement in their co-supervision, and an active contribution to the training activities and stakeholder workshops.

I hereby declare that I am entitled to commit into this process the entity I represent.

Through the proposed project, HOT-OSM anticipates hosting PhD researchers in our Tanzania or other country offices to examine questions such as: how does community mapping lead to changes in decision-making, awareness and sustainability targets at different levels in society and administration (including business), and what are the (dis)incentives at these levels to use and maintain the data? Anticipated research will also examine the use of community mapping data for establishment of flood models, and low-cost technological innovations for capturing elevation.

We very much look forward to collaborating with Instituut voor Milieuvraagstukken (IVM) – Institute for Environmental Studies for this project.

Kind regards,

Paul Uithol  
Director of Programs  
October 24, 2019

Vrije Universiteit Amsterdam  
Instituut voor Milieuvraagstukken (Institute for  
Environmental Studies)  
Attn. de heer P. Ward  
De Boelelaan 1087  
1081 HV AMSTERDAM

<b>Date</b>	<b>Our reference</b>	<b>Number of pages</b>
December 2, 2019	19-12-0009	1
<b>Contact person</b>	<b>Direct number</b>	<b>E-mail</b>
Hanneke van der Klis	+31(0)88 335 8180	Hanneke.vanderKlis@deltares.nl

**Subject**  
COMMITMENT LETTER FOR REVOLUTION PROPOSAL

Dear Mr Ward,

I undersigned Hanneke van der Klis, in my quality of Director of Subsurface and Groundwater Systems, commit to set up all necessary provisions to participate as partner organisation in the proposal REVOLUTION ('A new generation of REsearchers to reVOLutionise sustainable flood and drought risk soluTIONS') submitted within the call H2020-MSCA-ITN-2020 should the proposal be funded.

On behalf of Deltares, I also confirm that we will participate and contribute to the research, innovation and training activities as planned in this project. In particular, Deltares will be involved in the provision of secondments to Early Stage Researchers (ESRs), involvement in their co-supervision, and an active contribution to the training activities and stakeholder workshops. I hereby declare that I am entitled to commit into this process the entity I represent.

Deltares sees a growing need for researchers and practitioners that are capable to connect traditional and novel data sources, and data collection procedures, to use cases relevant to stakeholders in deltas, vulnerable to water scarcity and floods. Therefore, we very much underwrite the importance of REVOLUTION.

With kind regards,



dr.ir. H. van der Klis  
Director Subsurface and Groundwater Systems


## COMMITMENT LETTER FOR REVOLUTION PROPOSAL

To whom it may concern,

I undersigned Mateo Valero Cortés, in my quality of Director of Barcelona Supercomputing Center-Centro Nacional de Supercomputación, commit to set up all necessary provisions to participate as partner organisation in the proposal REVOLUTION ('A new generation of REsearchers to reVOLutionise sustainable flood and drought risk soluTIONS') submitted within the call H2020-MSCA-ITN-2020 should the proposal be funded.

On behalf of Barcelona Supercomputing Center-Centro Nacional de Supercomputación, I also confirm that we will participate and contribute to the research, innovation and training activities as planned in this project. In particular, our Barcelona Supercomputing Center-Centro Nacional de Supercomputación will be involved in the use of climate forecasts for hydrological applications, addressing the problem of what processing of existing climate forecast systems is needed to provide user-oriented climate information. BSC will contribute to the training activities and stakeholder workshops that will use climate forecast information as well as in the provision of secondments to Early Stage Researchers (ESRs), involvement in their co-supervision, and an active contribution to the training activities and stakeholder workshops I hereby declare that I am entitled to commit into this process the entity I represent.

Kind regards,



Mateo Valero  
Director

Prof. Mateo Valero Cortés



Director of Barcelona Supercomputing Center-centro Nacional de Supercomputación

Date: 6<sup>th</sup> November 2019

United Nations  Nations Unies

OFFICE FOR DISASTER RISK REDUCTION • BUREAU POUR LA REDUCTION DES RISQUES DE CATASTROPHES  
9-11 RUE DE VAREMBE, CH-1202 GENÈVE, FAX: +41-22-733-9531, TEL: +41-22-917-8907/8908

Ref. UNDRR/OUT/2019/01535

06 December 2019

Dear Dr. Ward,

I hereby endorse the application for “REVOLUTION” (A new generation of REsearchers to reVOLUtionise sustainable flood and drought risk soluTIONS) for the Marie Skłodowska-Curie ETN network, and confirm the support of the UN Office for Disaster Risk Reduction (UNDRR) as a Partner Organization, should it be retained for funding.

The project’s aim – *to train a new generation of researchers to contribute to monitoring and reaching the water-related targets of the 2030 Agenda for Sustainable Development inter alia by combining novel and traditional data sources that are geographically scalable and transferable* – is entirely consistent with the work required to support the realization of the outcomes and goals of the Sendai Framework for Disaster Risk Reduction 2015 – 2030 and risk informed sustainable development.

In support of the project, UNDRR may contribute to research on methods for improving global-scale flood risk assessment and potentially to training activities. Such activities are consistent with the Priorities for Action of the Sendai Framework, and are considered aligned with the vision of the Global Risk Assessment Framework. The UNDRR contact person for this project will be Mr. Adam Fysh ([adam.fysh@un.org](mailto:adam.fysh@un.org)).

UNDRR welcomes a positive consideration of this application and looks forward to working with other partners in supporting the achievement of the goals and targets of the Sendai Framework and the 2030 Agenda for Sustainable Development.

Yours sincerely,



Ricardo Mena  
Chief, Supporting and Monitoring  
Sendai Framework Implementation Branch  
United Nations Office for Disaster Risk Reduction

**END PAGE**

MARIE SKŁODOWSKA-CURIE ACTIONS

**Innovative Training Networks (ITN)**

**Call: H2020-MSCA-ITN-2020**

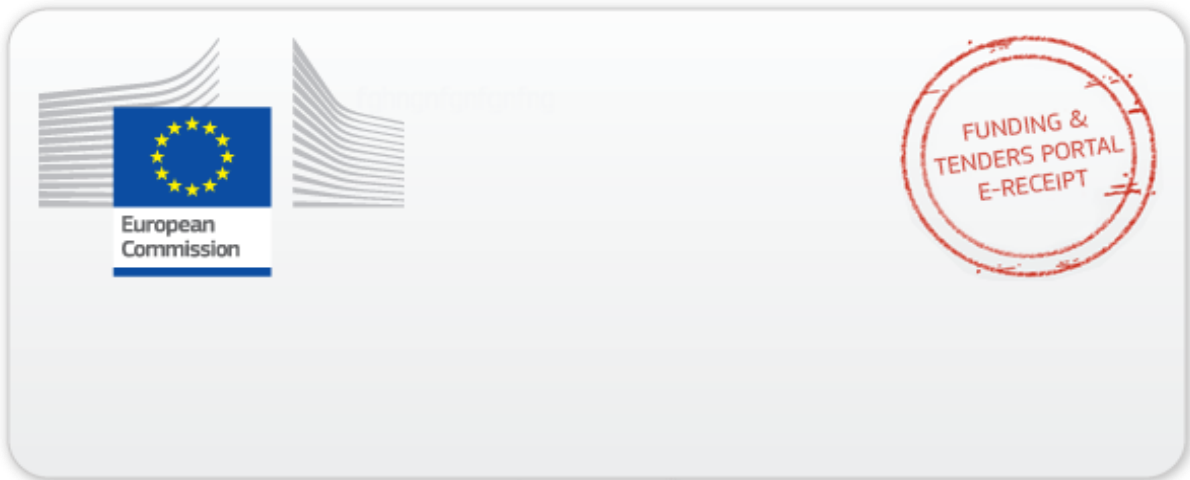
PART B

REVOLUTION

**A new generation of REsearchers to reVOLutionise sustainable flood and drought risk soluTIONs**

**This proposal is to be evaluated as:**

**ETN**



This electronic receipt is a digitally signed version of the document submitted by your organisation. Both the content of the document and a set of metadata have been digitally sealed.

This digital signature mechanism, using a public-private key pair mechanism, uniquely binds this eReceipt to the modules of the Funding & Tenders Portal of the European Commission, to the transaction for which it was generated and ensures its full integrity. Therefore a complete digitally signed trail of the transaction is available both for your organisation and for the issuer of the eReceipt.

Any attempt to modify the content will lead to a break of the integrity of the electronic signature, which can be verified at any time by clicking on the eReceipt validation symbol.

More info about eReceipts can be found in the FAQ page of the Funding & Tenders Portal.

<https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/support/faq>