

ERICA Mid-term Review Co-ordinator's Report

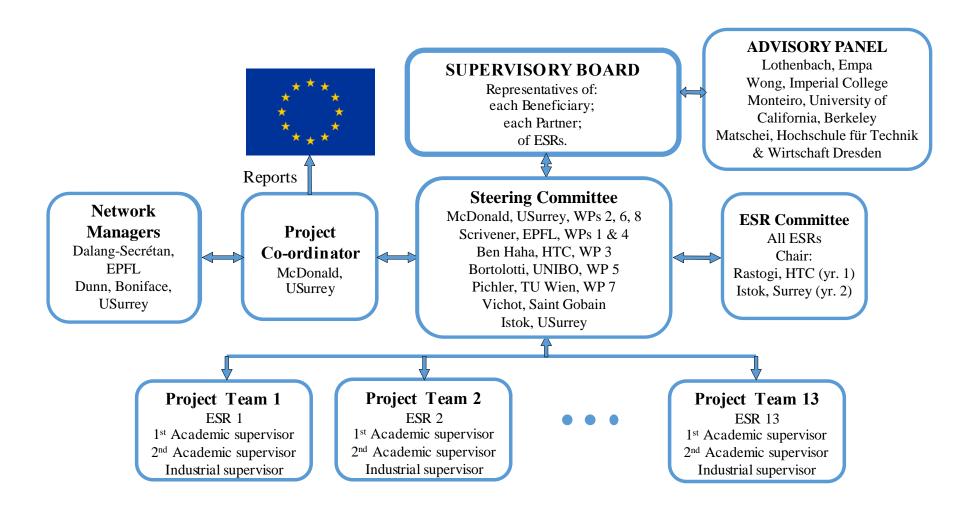
Wednesday 25th September 2019

Alma Mater Studiorum - Università di Bologna

H2020-MSCA-ITN-2017 Grant Agreement no. 764691

Management Structure





ERICA Steering Committee Members





Name	Beneficiary / Partner	Role / Responsibility
Peter McDonald	USurrey	Chair, Project Co-ordinator, WP 6 (Management), WP 2 (Water sorption research), WP 8 (Ethics)
Karen Scrivener	EPFL	WP 4 (Training), WP 1 (Materials Growth Research)
Mohsen Ben Haha	НТС	WP 3 (Upscaling Research)
Villiam Bortolotti	UNIBO	WP 5 (Recruitment)
Bernhard Pichler	TU Wien	WP 7 (Dissemination and Impact)
Angélique Vichot, Saint- Gobain (years 1 & 2)	Elected annually	Representative of the Partners
Monisha Rastogi (year 1) Örs Istok (year 2)	Elected annually	Representative of the ESRs

ERICA Steering Committee



Steering Committee Teleconferences 2 nd Tuesday of each month						
1. 13 th March 2018	10. 8 th January 2019					
2. 10 th April 2018	11. 12 th February 2019					
3. 8 th May 2018	12. 12 th March 2019					
4. 12 th June 2018	13. 9 th April 2019					
5. 10 th July 2018	14. 14 th May 2019					
6. 11 th September 2018	15. 11 th June 2019					
7. 9 th October 2018	16. 9 th July 2019					
8. 13 th November 2018	17. 3 rd September 2019					
9. 11 th December 2018						

Minutes are available on ERICA website. 2018 minutes are included in the year 1 reporting.

Supervisory Board (in person)

- 1. 22nd February 2018 (in Surrey)
- 2. 13th November 2018 (in Dublin, adjunct to Nanocem meeting)
- 3. 25th September 2019 (in Bologna)



ERICA Advisory Panel



- Barbara Lothenbach, Empa / NTNU
- Thomas Matschei, Hochschule für Technik und Wirtschaft Dresden (Chair)
- Paulo Monteiro, University of California, Berkeley
- Hong Wong, Imperial College

ERICA Consortium Agreement



- **Grant Agreement** was signed between the EC and the 5 Beneficiaries in August 2017.
- Consortium Agreement was signed in July 2018 by all Beneficiaries and 4
 Partners: CHRYSO; MR Solutions; Saint-Gobain Recherche S.A.; Septodont
 SAS.
- FEI Trondheim is not a Partner as originally envisaged as FEI was bought by Thermo Fisher and the Trondheim porous media numerical modelling group within it was disbanded.
- Following the 2nd Supervisory Board/1st year review meeting (Nov 2018, Dublin), the Beneficiaries and Partners decided formally that FEI would not be an industry Partner in ERICA
- In place of FEI we identified LafargeHolcim, Lyons, France, and NTNU,
 Trondheim, Norway, as Partners to provide alternate numerical modelling know-how and industry placements.

ERICA New Partner Organisations



- The group at the Norwegian University of Science and Technology (NTNU) led by Prof. Alex Hansen was identified as a replacement for modelling know-how
- LafargeHolcim Centre de Recherche, Lyon, was identified as a replacement for secondments
- Following the interim project check with the Project Officer on 26/03/2019 the agreement of the EC was confirmed for accession of NTNU and LafargeHolcim as new Partners in ERICA
- Replacements for industrial supervision by FEI/Thermo Fisher are HTC (Beneficiary) and LafargeHolcim (Partner)



All ERICA ESRs were recruited during the first 12 months

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
	01/11/2017 –	01/02/2018 –	01/05/2018 –	01/08/2018 –
	31/01/2018	30/04/2018	30/07/2018	31/10/2018
Number of ESRs recruited	5	3	0	5





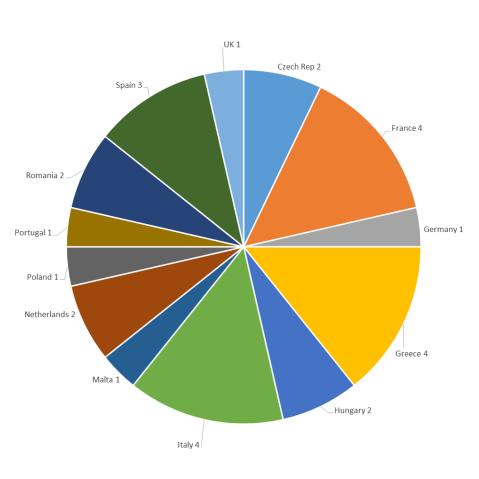
ERICA ESR recruitment figures

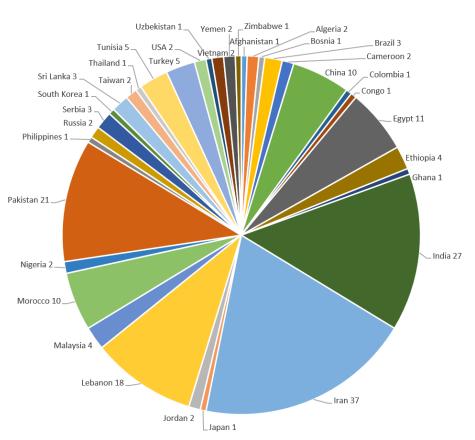
	Number	%
Total number of applications, of which:	220*	-
Male	166	75
Female	54	25
EC	28	13
Non EC	190	87
ESRs (appointed):	13	-
Male/Female	7/6	54/46
EC/Non EC	7/6	54/46

^{*} total includes 2 where nationality is unknown



Breakdown of applications by nationality:





EU

Non EU



Notes:

- In general, it has been easier to recruit to the experimental projects rather than the numerical modelling projects.
- In general, we have found candidates are wary of applying to/accepting posts in the UK. We put this down to uncertainty surrounding BREXIT.
- Since all PhDs in Italy can start only on 1st November, the PhD registration and employment start date of ESR 2 hosted at UNIBO is out of synchronisation. Notwithstanding, all arrangements are in place to ensure that ESR 2 can complete his PhD.



Recruited ESRs

ESR	Host	Start date	
1	EPFL	01/09/2018	Growth and synthesis of hydrates
2	UNIBO	01/02/2018	¹ H NMR relaxation characterisation of hydrates
3	EPFL	01/02/2018	Molecular dynamic simulations of hydrate structure
4	UNIBO	01/11/2018	¹ H NMR characterisation of first sorption cycle
5	USurrey	02/01/2018	Localised NMR measurements of sorption to separate spatio-temporal effects
6	HTC	01/01/2018	Characterisation of water sorption cycle in hydrates of controlled oxide composition
7	USurrey	01/11/2018	Molecular dynamic and Monte Carlo study of water in hydrates during desorption and re-sorption



Recruited ESRs

ESR	Host	Start date	
8	TU Wien	03/11/2017	Multiscale modelling of shrinking C-S-H
9	USurrey	05/02/2018	Upscaling towards applications: Water transport in agglomerates
10	EPFL	01/10/2018	Multiscale Modelling of Chloride Transport in Cementitious Materials (Original project: Modelling of hydrate microstructure at the particle size/agglomerate level (microns))
11	USurrey	01/11/2018	Lattice Boltzmann modelling of water transport in hydrates agglomerates
12	TU Wien	03/11/2017	Multiscale design of engineered C-S-H in dentistry
13	HTC	01/01/2018	Up-scaling production of controlled hydrates





Date	Project Month	Locatio n	Title	Date	Activity Detail	Attendees
3 August 2017	-1	EPFL	Recruitment event		Interviews for shortlisted candidates	Beneficiaries, interview candidates
20-23 February 2018	4	Surrey	Workshop 0	20 & 21/02	From TRANSCEND to ERICA: Getting up to speed: Consolidation of existing know-how	ERICA ESRs: 7 Benef. reps: 13 Partner reps: 5 Others: 7
			Consortium Meeting 1	22/02	Kick off; 1 st Supervisory Board Meeting	ERICA ESRs: 7 Benef. reps: 13 Partner reps: 6 Others: -
			Residential Training School 0	23/02	Research skills training school	ERICA ESRs: 7 Benef. reps: 5 Partner reps: - Others: -





Date	Project Month	Location	Title	Date	Activity Detail	Attendees
3–6 April 2018	6	EPFL	Residential Training School 1		Cementitious Materials and Characterization Methods (except NMR) training school	ERICA ESRs: 8 Others: 28
11-15 June 2018	8	Surrey	Residential Training School 2	11 & 12/06	Numerical Modelling training school 1. Poromechanics and Mont Carlo	ERICA ESRs: 8 Benef. reps: 2 Others: 2
			Workshop 1	13/06	Cement Applications: Opportunities, Problems and Sustainability	ERICA ESRs: 8 Benef. reps: 3 Others: 2
			Residential Training School 2	14 & 15/06	NMR Theory and Practice	ERICA ESRs: 8 Benef. reps: 2 Partner reps: 1 Others: 2





Date	Project Month	Location	Title	Date	Activity Detail	Attendees
11-12 July 2018	9	EPFL	Workshop 2 (Modelling Workshop)	11 & 12/07	Numerical Modelling: State of the Art and Best Practice for Cements	ERICA ESRs: 2 Benef. reps: 6 Others: 4
12-13 Nov. 2018	13	Dublin (hosted by Nanocem)	Consortium Meeting 2	12/11	First year review	ERICA ESRs: 9 Beneficiaries: 9 Partners: 2 Others: 6 (Nanocem)
				13/11	2 nd Supervisory Board Meeting	ERICA ESRs: 9 Beneficiaries: 9 Partners: 2 Others: 3 (External Advisory Panel)





Date	Project Month	Location	Title	Date	Activity Detail	Attendees
14-17 January 2019	15	EPFL	Residential Training School 3	14/01 to 16/01	Numerical Modelling 2: Transport Processes in Cementitious Mats; Lattice Boltzmann, Finite Element	ERICA ESRs: 13 Benef. reps: 8 Partner reps: - Others: 6
			Modelling Workshop	17/01	Additional workshop to coordinate modelling projects	ERICA modelling ESRs only: 7
11-15 February 2019	16	TU Wien	Residential Training School 4		Leadership, Teamwork, Outreach, Impact & Entrepreneurship	ERICA ESRs: 12 Benef. reps: 2 Others: 22
				11&12/02 14/02	Building Your Leadership Presentation & Interview ESRs only)	
				15/02	Get ready for Public Outro (ERICA ESRs only)	each (half day)





ESRs who missed a Residential Training School during year 1 due to delays in recruitment or who require additional training have further opportunities, e.g.:

Date	Project Month	Location	Title	Date	Activity Detail	Attendees
2/3 & 9/10 April 2019	18	USurrey	Additional NMR training	02 & 03/04 09 & 10/04	Practical magnetic resonance training for students in groups of 2/3	ERICA ESRs: 3 Others: 2
23–26 April 2019	18	EPFL	Residential Training School 1 (Repeat)		Cementitious Materials and Characterization Methods	ERICA ESRs: 5 Others: 37
25-26 Sept 2019	23	UNIBO	Mid-term Review & Workshop	25/09	Mid-term Review meeting with REA Project Officer Sorption Workshop (half day)	
2020	TBC	USurrey	Residential Training School		Further numerical modelling	ESRs who did not attend first time around





Other upcoming planned events:

Date	Project Month	Location	Title	Date	Activity Detail	Attendees
27-31 January 2020	27	USurrey	Residential Training School 5	27-31 /01	Careers Workshop: What Next? Impact/Outreach Team Activity: Conclusion Entrepreneurship Team Activity: Conclusion	ERICA ESRs Partners
8-9 July 2020	33	EPFL	Workshop 4 & Consortium Meeting 4	08 & 09/07	Workshop: Towards New Applications Consortium Meeting 4 / Third Year Review	All
24-27 January 2021	39	HTC	Final Conference		ERICA final dissemination conference, Heidelberg	All
July 2021	45	USurrey	Consortium Meeting 5	tbc	Consortium Meeting 5: Wrap-up	All

ERICA Final Conference January 2021



SAVE THE DATE!



ERICA Final Conference January 24-27, 2021



Print Media Academy (PMA)
Heidelberg, Germany







ERICA Final Conference January 2021



Preliminary Programme

Sunday, January 24

18:00-19:30 Registration at NH Hotel

19:30 Dinner at NH Hotel



Monday, January 25

08:00-18:00 Conference at PMA

18:30 Dinner at Level12 (PMA)

Tuesday, January 26

08:00-17:00 Conference at PMA

17:00 Visit of old town of Heidelberg & University

afterwards Dinner at University or Headquarters of HeidelbergCement (tbd)

Wednesday, January 27

08:00-12:00 Conference at PMA

12:00 Farewell



- ESRs received formal training in public engagement and outreach at Training School 4 (Feb. 2019, TU Wien)
- They have been working on practical outreach activities:
 - required to develop activity within their local community
 - aiming to leave legacy materials for the ERICA project
 - around 40 hours work per ESR
 - previous activities have included science "taster days" in schools, web-based materials, information videos for the general public
- ESRs are mentored by their local University Outreach and Impact Officers and by industrials from HTC and ERICA Partners
- Written report to be submitted in Nov. 2019 (Deliverable D7.1/D25) and ESRs will present reports at Training School 5 (Jan. 2020, Surrey)





Name	Outreach activity
ESR 1 (EPFL)	Outreach events at the ESR's former middle school, highlighting the importance of building materials with an emphasis on sustainability in materials. [October 2019]
ESR 2 (UNIBO)	Public outreach presentation about the ESR's research field and ERICA project at Bologna University. [Autumn 2019]
ESR 3 (EPFL)	Presentation on molecular dynamic simulation methods to bachelor and master-level university students. [Autumn 2019]
ESR 4 (UNIBO)	Outreach activity on 'Nuclear Magnetic Resonance in cement investigation' at ESR's former university involving a theoretical and practical session for bachelor and PhD students. [May 2019]
ESRs 5, 7, 9, 11 (USurrey)	Joint activity on 'Cement, the material making up the world around us' at the University of Surrey, UK, to a target audience of around 30 16-year old A level students, comprising a lecture and hands-on practical workshop exploring various properties of cement. [July 2019]
ESR 6 (HTC)	Animated video providing an overview of the fundamental science pertaining to the ERICA project for upload to social media platforms such as YouTube and LinkedIn, with the aim of increasing visibility for the project.
ESR 8 (TU Wien)	Outreach activity in the ESR's former high school comprising a talk to 1 st and 2 nd year science and technology students. [March 2019]
ESR 10 (EPFL)	Outreach presentation on the ESR's work in ERICA at the annual EPFL "Kids class day". [June 2019]
ESR 12 (TU Wien)	Presentation on ERICA to high school students. [September 2019]
ESR 13 (HTC)	Outreach activity to be carried out at a school in the ESR's home region. [Autumn 2019]



USurrey ESRs (left) with the group of 16-17 year old A-level students at their outreach session on 'Cement, the material making up the world around us' at the University of Surrey, UK, on 25 July 2019.



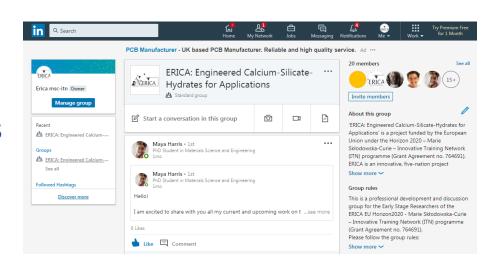




ESRs are encouraged to maintain an active social media profile

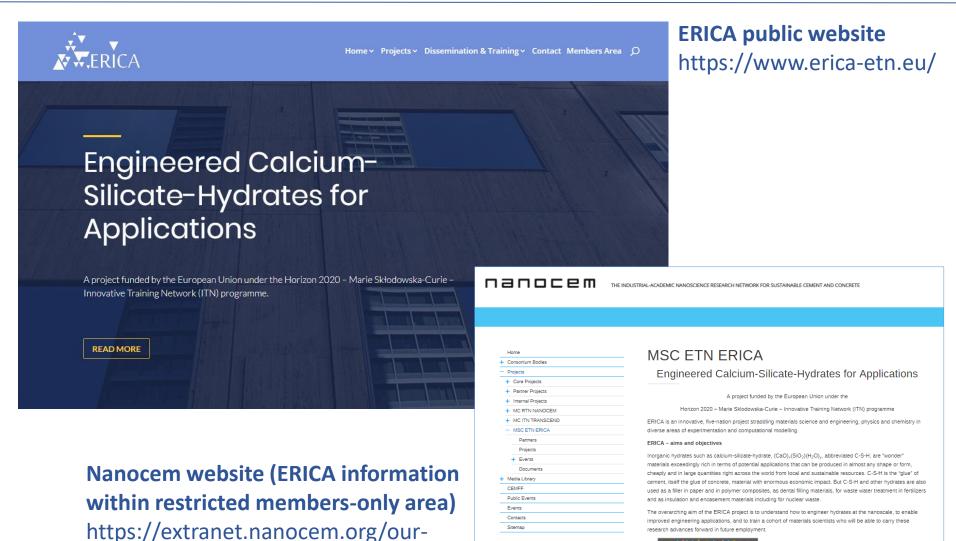
The ERICA ESRs have created a (closed) LinkedIn group www.linkedin.com/groups/13647699/ and (open) webpage www.linkedin.com/company/erica-itn/ allowing users to view content without having to join the LinkedIn group

Currently the group has 20 members, 13 of whom are the ESRs and the rest are academics and experts in the field of cement science



ERICA and Nanocem Websites





Search this website

research/msc-etn-erica/



- All ESRs based in Universities are expected to undertake one or more industry and / or academic placement totalling about 5 months
- The main period planned for secondments is in year 3 during project months 27-32
- Some preparatory visits and shorter secondments have already taken place



Originally planned secondments (from proposal):

ESR	Activity Title	Secondment non-academic organisation	Duration (months)
1	Learn and perform characterisation of hydrate shrinkage in an industrial environment	HTC	4
2	Learn and perform characterisation of hydrate porosity in an industrial environment	HTC	4
	Work as application scientist: Show NMR of dental hydrates on commercial equipment	MRSolutions	2
3	Transfer molecular dynamics modelling of additives in hydrate structures to industry	CHRYSO	4
4	Learn and perform characterisation of hydrate sorption in an industrial environment	HTC	4
	Work as application scientist: Show NMR of water treatment cements on commercial equipment	MRSolutions	2
5	Learn and perform sorption measurements in additive modified hydrates in industry	CHRYSO	4
	Work as application scientist: Show MRI of oil-well cements on commercial equipment	MRSolutions	2
7	Learn and perform microscopic shrinkage/swelling characterisation of hydrates in industry	SGR	4
8	Learn and perform macroscopic shrinkage/swelling characterisation of hydrates in industry	SGR	4
9	Learn and perform multiphase FE modelling of liquid transport using commercial software	FEI	4
	Work as application scientist: Show MRI of construction concrete on commercial equipment	MRSolutions	2
10	Learn numerical modelling of off-lattice structures using commercial software	FEI	3
	Transfer to, and demonstrate the model μ IC in, an industrial environment	HTC	3
11	Learn and perform LB modelling in an industrial environment with commercial software	FEI	4
12	in vitro tests of MTAs to assess strength-related biocompatibility using industry methods	SEPTODONT	4

LafargeHolcim and NTNU will be providing placements in place of FEI



Preparatory visits and placements already undertaken:

ESR(@)	Host	Date (duration)	Purpose
ESR 1	USurrey	April 2019	NMR training: two-day hands-on laboratory practice and
(EPFL)		(2 days)	data analysis session (with other ERICA ESRs and external
			students)
ESR 2	EPFL	Mar/Apr 2018	To learn / produce around 1kg of C₃S powder (purity > 95%
(UNIBO)		(2 weeks)	as measured by XRD) in order to analyse hydration of C₃S by ¹ H NMR
	USurrey	Jan/Feb 2019	NMR practical training and collaboration with David Faux on
		(3 weeks)	his 3-tau model of T1 dispersion curves which are obtained
		Apr 2019	with a Fast Field Cycling device
		(1 week)	Resolving issues with the J(ω) spectral density function
	EPFL	Feb/Mar 2019	Production and synthesis of cementitious materials: C₃S
		(3 weeks)	with/without paramagnetic component (Al, Fe, Mg, Zn)
ESR 4	USurrey	April 2019	NMR training: two-day hands-on laboratory practice and
(UNIBO)		(2 days)	data analysis session (with other ERICA ESRs and external
			students)
ESR 6	EPFL	Apr/May 2018	Investigation of influence of curing temperature,
(HTC)		(2 months)	characterizing degree of hydration in sliced samples at
			different ages (3, 7 and 28 days) and at different
			temperatures (10°C, 20°C, 40°C and 60°C) on freshly sliced
			samples, training on SEM technique with a focus on
			maximizing C-S-H content in the hydrated cement product
ESR 9	Lafarge-	Mar/Apr 2019	Sample preparation from 4 different cement paste mixes
(USurrey)	Holcim	(2 weeks)	and planning further research. The goal is to compare the
			results of water transport (MRI), pore size distribution
			(Benchtop NMR) and water sorption (GARField) for
			carbonated and non-carbonated samples (control samples).
			Samples carbonated at Lafarge: 1% or 3% CO ₂ , 20°C, 65% RH
ESR 12	Septodont	April 2019	Introduction to laboratory equipment and sample
(TUWien)		(1 day)	preparation at Septodont
	USurrey	April 2019	NMR training: two-day hands-on laboratory practice and
		(2 days)	data analysis session (with other ERICA ESRs and external
			students)
ESR 13	EPFL	Apr/May 2018	Investigation focusing on characterization of synthesized
(HTC)		(2 months)	dicalcium silicate, linking physical properties such as particle
			size distribution and specific surface area to the reactivity
			and development of maximum hydrated products.



ESR (@)	ACTIVITY	ORIGINAL SEC	ONDMENTS PLAN A	S PER GA	COMPLETED SECONDMENTS / CURRENT PLANS		
		Secondment or	Start	Duration	Secondment or	Start	Duration
		visit host	(project month)	(months)	visit host	(project month)	(months)
ESR 1 (EPFL)	Participation in ¹ H NMR analyses	UNIBO	10	1	Not yet re-schedule	IBO delayed due to late ed. However, ESR 1 vis f practical MR training	ited Surrey for
	Learn and perform characterisation of hydrate shrinkage in an industrial environment	НТС	27	4	НТС	February 2020 (pm 28)	3 months
	NMR training: hands-on laboratory practice and data analysis				USurrey	2/3 April 2019 (pm 18)	2 days
	Carry out NMR on synthetic C-S-H				USurrey	End of 2019 (pm 26, tbc)	1 month
ESR 2 (UNIBO)	Participation in materials synthesis	EPFL	11	1	EPFL	21 Mar to 6 Apr 2018 (pm 5/6)	2 weeks
					measured by XRD)	l 1kg of C ₃ S powder (pu I in order to analyse hyd by ¹ H NMR at EPFL	•
	Learn and perform characterisation of hydrate porosity in an industrial environment	HTC	27	4			
	Work as application scientist: show NMR of dental hydrates on commercial equipment	MR Solutions	31	2	method of NMR da this to commercial	ess implementing software. It is expected ESR 2 instrumentation at Steined secondment to Milearly 2020	will transition lar rather than
	NMR practical training on measurements on cement; collaboration with David Faux on his 3-tau model of T ₁ dispersion curves which are obtained with a Fast Field Cycling device.				USurrey	20 Jan to 9 Feb 2019 (pm 15/16)	3 weeks
	Production and synthesis of cementitious materials: C ₃ S with/without paramagnetic component (Al, Fe, Mg, Zn).				EPFL	19 Feb to 13 Mar 2019	3 weeks
	Resolving issues with the $J(\omega)$ spectral density function.				USurrey	7-13 April 2019 (pm 18)	1 week



ESR (@)	ACTIVITY	ORIGINAL SECO	ORIGINAL SECONDMENTS PLAN AS PER GA			COMPLETED SECONDMENTS / CURRENT PLANS		
		Secondment or	Start	Duration	Secondment or	Start	Duration	
		visit host	(project month)	(months)	visit host	(project month)	(months)	
ESR 3	Align work with ESR 7 at USurrey	USurrey	11	1	Delayed o	lue to late start of ESR	7.	
(EPFL)					Now p	lanned for April 2020.		
	Transfer molecular dynamics modelling of additives in hydrate structures to industry	Chryso	27	4				
ESR 4 (UNIBO)	NMR training: hands-on laboratory practice and data analysis				USurrey	9/10 April 2019 (pm 18)	2 days	
	Learn and perform characterisation of hydrate sorption in an industrial environment	HTC	27	4				
	Work as Application Scientist: show NMR of water treatment cements on commercial equipment	MR Solutions	31	2	magnet build) separate	eriods of 1 month (magno ed by 2-3 months during v ovember 2019 and early 2 ESR 5	which a magnet	
ESR 5	Work as Application Scientist: show MRI of oil well	MR Solutions	31	2	Plan is now for t	wo periods of 1 mont	h (magnet	
(USurrey)	cements on commercial equipment				during which a mag	et build) separated by gnet holder is machine early 2020, joint with E	ed. November	
	Sorption measurements in modified hydrates	Chryso	27	4				
	Measurements for correlation with ESR 7's modelling				Dublin	27 Oct – 2 Nov 2019	1 week	



ESR (@)	ACTIVITY	ORIGINAL SECO	NDMENTS PLAN AS	S PER GA	COMPLETED SEC	ONDMENTS / CURR	ENT PLANS
		Secondment or	Start	Duration	Secondment or	Start	Duration
		visit host	(project month)	(months)	visit host	(project month)	(months)
ESR 6 (HTC)	Training in research methods and techniques at EPFL	EPFL	1	4	EPFL	1 April to 31 May 2018 (pm 6/7)	2 months
					EPFL	April/May 2019 (pm 18/19)	2 months
	Training in research methods and techniques at EPFL	EPFL	25	2	EPFL	Summer 2020 (pm 36 tbc)	1 month
						Aug to Oct 2021 (pm 46-48)	3 months
ESR 7 (USurrey)	Learn and perform microscopic shrinkage/ swelling characterisation of hydrates during sorption in industry	SGR	27	4			
	Align projects	EPFL	10	1			
ESR 8 (TU Wien)	Learn and perform macroscopic shrinkage/ swelling characterisation of hydrates during sorption in industry	SGR	27	4	October 2018 (2 da	d meeting with industrys), but planning now out of relevant SGR pers	cancelled due
						Feb 2020 to coincide viking in parallel with Es	

ESR 9	Measurements of CI transport	EPFL	20	1			
(USurrey)	Learn and perform multiphase FE modelling of liquid	FEI	27	4	Cancelled (due	to departure of FEI from	ERICA)
	transport using commercial software				,	•	,
	Work as an Application Scientist: show MRI of	MR Solutions	31	2		Cancelled	
	construction concrete on commercial equipment						
	Substantive placements now planned at LafargeHolcim				LafargeHolcim	28 Mar to 5 Apr 2019	½ month
	with focus on water sorption transport in carbonated					(pm 17/18)	
	materials. Next visits: measure capillary rise, vapour					I week in each of Oct,	3 weeks
	permeability cup test and gas diffusivity.					Nov, Dec 2019 (pm	
						24-26)	1½ month
						Jan 2020 (pm 27) or	
						Nov 2020 (pm 37)	



ESR (@)	ACTIVITY	ORIGINAL SECONDMENTS PLAN AS PER GA			COMPLETED SECONDMENTS / CURRENT PLANS		
		Secondment or	Start	Duration	Secondment or	Start	Duration
		visit host	(project month)	(months)	visit host	(project month)	(months)
ESR 10 (EPFL)	Engage with poromechanical modelling	TU Wien	20	1			
` ,	Learn numerical modelling of off-lattice structures using commercial software	FEI	27	3	Cancelled (due	to departure of FEI fro	m ERICA)
	Transfer to, and demonstrate the model µIC in, an industrial environment	HTC	30	3	Proje	ect is being refocused	
	Learn numerical methods appropriate to study of chloride ingress in cementitious materials				NTNU	April 2020 (pm 30) April 2021 (pm 42)	1 month 1 month
ESR 11	Learn µIC model	EPFL	10	1	N	o longer relevant	
(USurrey)	Engage with poromechanical modelling	TU Wien	20	1			
	Learn and perform LB modelling in an industrial environment with commercial software	FEI		4	Cancelled (due	to departure of FEI fro	EI from ERICA) it in 1 week
	Use commercial software to validate LB results				LafargeHolcim	Planning to visit in Nov 2019 Primary work in late 2020	1 week 3 months
ESR 12 (TU Wien)	in vitro tests of MTAs to assess strength-related biocompatibility using industry methods	Septodont	27	4	April 2018, main sec 2020 - compress	has started, Septodor condment is planned f sive strength test of Bio ses of different compo Biodentine	rom 1 March odentine,
	NMR training: hands-on laboratory practice and data analysis				USurrey	9/10 April 2019 (pm 18)	2 days
	XRD and 1H NMR experiments				EPFL	To be confirmed	



ESR (@)	ACTIVITY	ORIGINAL SECO	NDMENTS PLAN AS	S PER GA	COMPLETED SECO	NDMENTS / CURR	ENT PLANS
		Secondment or	Start	Duration	Secondment or	Start	Duration
		visit host	(project month)	(months)	visit host	(project month)	(months)
ESR 13	Training in research methods and techniques at EPFL	EPFL	1	4	EPFL	1 Apr to 31 May	2 months
(HTC)						2018 (pm 6/7)	
					EPFL	14 Aug to 14 Sep	1 month
						2019 (pm 22/23)	
	Training in research methods and techniques at EPFL	EPFL	25	2	EPFL	early 2020	1 month
						(pm 27-32)	
						Sep to Oct 2021	2 months
						(pm 47/48)	

ERICA Research Data Management



- The initial research Data Management Plan (DMP) was submitted as deliverable D32 (24/07/2018)
- The DMP document has been reviewed and updated as the full cohort of ESRs have started their individual projects (version 1.1, updated May 2019, deliverable was re-submitted 29/08/2019)
- The DMP is a standing item on the agenda of the monthly Steering Committee teleconferences

ERICA Reporting





Milestones and deliverables

Milestone	Title	Date Due
no.		
MS 1	Project successfully launched	May-2018
MS 8	Planned recruitment completed	Nov-2018
MS 9	Project check	Dec-2018
MS 2	Mid-project research results published	Aug-2019
MS 3	Residential schools and workshops complete	Aug-2020
MS 4	Final research results reported	Feb-2021
MS 5	Training complete	Feb-2021
MS 6	Dissemination conference (at HTC)	Feb-2021
MS 7	Dissemination complete	Nov-2021

۷o.	Title	Date Due
D20	Advertising complete	30-Nov-2017
D24	ERICA website setup and maintenance	30-Nov-2017
D30	Consortium Agreement	31-Dec-2017
D31	Supervisory Board of the Network	31-Dec-2017
D32	Data Management Plan	30-Apr-2018
D1	EPQ - Requirement No. 1	31-Oct-2018
D21	ESR selection complete and contracts awarded	31-Oct-2018
D7	GARField probe built	31-Oct-2018
D2	NEC - Requirement No. 2	31-Oct-2018
D3	Report on hydrates grown	31-Oct-2018
D22	Progress report	30-Nov-2018
D5	Molecular scale model (software)	31-Jul-2019
D4	Report on hydrate characterisations	31-Jul-2019
D10	Report on transport in agglomerates	31-Jul-2019
D25	13 outreach/impact projects completed	31-Oct-2019
D14	5 Residential schools completed	29-Feb-2020
D17	Entrepreneurship activities completed	29-Feb-2020
D16	Impact/outreach activity reports	29-Feb-2020
D8	Report on characterisation of sorption cycle	30-Apr-2020
D11	Report on dental materials	30-Apr-2020
D6	Reports on test of Gartner model	30-Apr-2020
D15	4 Discussion Workshops held	31-Jul-2020
D19	13 Career Development Plans completed	31-Jan-2021
D18	5 month secondments completed	31-Jan-2021
D26	Int. dissemination confs. (science/local org)	31-Jan-2021
D12	LB & refined IC models (software)	31-Jan-2021
D9	Report on sorption & shrinkage models	31-Jan-2021
D13	Report on upscaling production of hydrates	31-Jan-2021
D23	Lists of publications, patents, exploitable results	31-Oct-2021
D29	Modelling software made shareware	31-Oct-2021
D28	NMR best practice guide	31-Oct-2021
D27	Publications, videos, factsheets etc	31-Oct-2021
		-

ERICA Reporting



Deliverables / milestones to September 2019 (project month 23)

Deliv/ Mile- stone	WP	Title	Lead	Туре	Due month	Due date	Submitted
D 20	5	Advertising complete	UNIBO	Other	1	30/11/2017	09/01/2018
D 24	6	ERICA website setup and maintenance	EPFL	Other	1	30/11/2017	09/01/2018
D 30	6	Consortium Agreement	USurrey	Other	2	31/12/2017	24/07/2018
D 31	6	Supervisory Board of the Network	USurrey	Other	2	31/12/2017	24/07/2018
D 32	6	Data Management Plan	USurrey	ORDP	6	30/04/2018	24/07/2018 Version 1.1: 29/08/2019
M 1	5	Project successfully launched	USurrey	Milestone	6	30/04/2018	Achieved

ERICA Reporting



Deliverables / milestones to September 2019 (project month 23)

Deliv. /Mile- stone	WP	Title	Lead	Туре	Due month	Due date	Submitted
D 1	8	EPQ - Requirement No. 1	USurrey	Ethics	12	31/10/2018	29/11/2018
D 2	8	NEC - Requirement No. 2	USurrey	Ethics	12	31/10/2018	29/11/2018
D 3	1	Report on hydrates grown	EPFL	Report	12	31/10/2018	31/10/2018
D 7	2	GARField probe built for spatio-temporal studies	USurrey	Other	12	31/10/2018	21/10/2018
M 8	6	Planned recruitment completed	USurrey	Milestone	12	31/10/2018	Achieved
D 21	5	ESR selection complete and contracts awarded	UNIBO	Other	12	31/10/2018	29/11/2018
D 22	6	Progress report	USurrey	Other	13	30/11/2018	29/11/2018
M 9	6	Project check	USurrey	Project Officer meeting with Consortium	13	30/11/2018	Achieved

ERICA Reporting



Deliverables / milestones to September 2019 (project month 23)

Deliv. /Mile- stone	WP	Title	Lead	Туре	Due month	Due date	Submitted
D 4	1	Report on hydrate characterisations	UNIBO	Report	21	31/07/2019	27/07/2019
D 5	1	Molecular scale model (software)	EPFL	Other	21	31/07/2019	27/07/2019
D 10	3	Report on transport in agglomerates	USurrey	Report	21	31/07/2019	27/07/2019
M 2	1,2,3	Mid-project research results reported	USurrey	Milestone	21	31/07/2019	Achieved
D 25	7	13 outreach/impact projects completed	EPFL	Other	24	31/10/2019	(not yet due)

There are currently no outstanding deliverables / milestones

ERICA Project Calendar





Project year						YEA	AR 1											YEA	R2											YEA	R3											YE/	AR 4					
Project month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
Month/year	Nov-2017	Dec-2017	Jan-2018	Feb-2018	Mar-2018	Apr-2018	May-2018	Jun-2018	Jul-2018	Aug-2018	Sep-2018	Oct-2018	Nov-2018	Dec-2018	Jan-2019	Feb-2019	Mar-2019	Apr-2019	May-2019	Jun-2019	Jul-2019	Aug-2019	Sep-2019	Oct-2019	Nov-2019	Dec-2019	Jan-2020	Feb-2020	Mar-2020	Apr-2020	May-2020	Jun-2020	Jul-2020	Aug-2020	Sep-2020	Oct-2020	Nov-2020	Dec-2020	Jan-2021	Feb-2021	Mar-2021	Apr-2021	May-2021	Jun-2021	Jul-2021	Aug-2021	Sep-2021	Oct-2021
Start date, end date, reporting periods										R	epor	rting	Per	iod 1	L																			R	epor	ting	Per	iod 2	2									
Milestones							1						8	9								2												3						4,5, 6								7
Deliverables & reports	М	М				М			\Box			M,R	М								R			Т				Т		R									R,T					П	\Box	\Box	N.	M,R,T
Workshops			S	urre	y	EPFL	Si	urrey	EPFL						EPFL	TUW	ien	Surre	ey			U	NIBC)									EPFL											П	\Box	\Box		П
Consortium meetings			S	Surre	y							D	ublin	1								U	NIBC)									EPFL											S	Surrey	y		
Training schools			S	urre	y	EPFL	9	Surrey	y						EPFL	TUW	ien I	EPFL								S	urre	/																	\Box			
Industry secondments																																												П	\Box	\Box		
Dissemination																																					Fina	ıl Cor	nfere	nce I	HTC							

Milestone	Title
1	Project successfully launched
2	Mid-project research results published
3	Residential schools and workshops complete
4	Final research results reported
5	Training complete
6	Dissemination conference, HTC
7	Dissemination complete
8	Planned recruitment completed
9	Project check

Deliverables & reports:

M Management

R Research

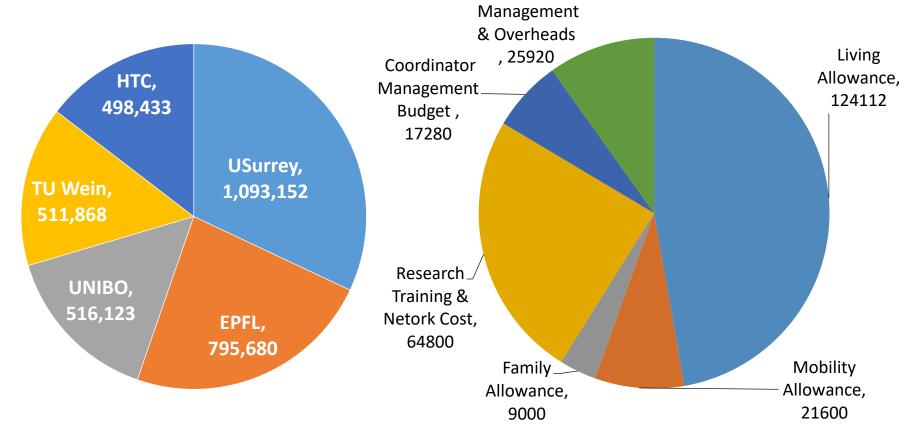
T Training

Dissemination:

Final conference, HTC

ERICA Finances





Total budget € 3,415,256

Average budget per ESR € 262,712 (country / individual variations)

ERICA Finances



Organisati	on	Number		_		Prefinancing -			Prefinancing	•		Total Budget
		of ESRs	Budget	- Gross	g - Net	Management	• .		Transactions	1		
						Budget	Institution		(Management			
									Budget			
									transferred to			
				(80% of Total	/Drofinancin	(80% of	Dudgot	Contribution to	Surrey)	Pudget	Contribution	Prefinancing +
				Budget)	•	Management	•			Payment per	to	Remaining
				baagetj	_	Budget LESS	per	Budget			Management	Kemaning
					Guarantee	•	Partner	244001			Budget	
					Fund)	Guarantee					0	
						Fund)						
USurrey	prefinance	4	1093152	874521	819864	51840	768024	51840	936504	256008	17280	1093152
	remain								156648			
EPFL	prefinance	3	795680	636544	596760	38880	557880	38880	557880	185960	12960	795680
	remain								237800			
UNIBO	prefinance	2	516123	412898	387092	25920	361172	25920	361172	120391	8640	516123
	remain								154951			
TU WIEN	prefinance	2	511868	409495	383901	25920	357981	25920	357981	119327	8640	511868
	remain								153887			
HTC	prefinance	2	498433	398746	373825	25920	347905	25920	347905	115968	8640	498433
	remain								150528			
	TOTALS	13	3415256	2732204	2561442	168480	2392962	168480	3264727	797654	56160	3415256

ERICA ESR Career Development Plans



- All ESRs have submitted an initial Career Development Plan
- Those already in year 2 have updated their CDPs
- Year 3 updates start in November 2019

ERICA ESR Personal Progress Portfolio



- ESRs submit a monthly report on research progress, training, visits, secondments, outreach activities, dissemination outputs and other achievements, building a Personal Progress Portfolio
- USurrey uses the information to produce the summary of technical progress for the annual report

ERICA Mid-term Review



- Project management and technical progress to date are summarised in the draft mid-term review report (submitted to the Project Officer on 31 July 2019)
- Formal submission of the mid-term report is due at the end of period 1, i.e. after project month 24
- Project management issues, progress with impacts, dissemination and exploitation of results and any deviations from the planned programme are summarised in the following slides
- Followed by updates from the ESRs on scientific progress

ERICA Exploitation and Dissemination of Results





Conferences

- All ESRs are offered the opportunity to participate in at least one national or international conference
- Summary of presentations by ESRs at external meetings and conferences so far

Publications

- •Target is 33+ peer reviewed academic journal publications (2.5/ESR) over the project lifetime. We expect to achieve this since most publications arise during the last (third) year of ESRs' projects
- •End of project open conference
- Web-based learning materials
- Contributions to trade magazines
- Nanocem meetings

ESR	Meeting	Title	Date/location
ESR 2	11th Conference on Fast	FFC-NMR dispersion of hydrated	June 5-7, 2019,
(UNIBO)	Field Cycling NMR	C₃S: a Matlab script for the	Pisa, Italy
	Relaxometry	profile fitting by the 3τ model, RAB Kogon, V Bortolotti, L Brizi, P Fantazzini, DA Faux, PJ McDonald	
ESR 8	GAMM 2019: 90th Annual	Homogenization of stiffness and	Feb 18-22,
(TU Wien)	Meeting of International	eigenstresses /eigenstrains of	2019, Vienna,
	Association of Applied	matrix-inclusion composites, N	Austria
	Mathematics & Mechanics	Segura, B Pichler, C Hellmich	
ESR 12	GAMM 2019: 90th Annual	Innovative characterization and	Feb 18-22,
(TU Wien)	Meeting of International	multiscale modeling of dental	2019, Vienna,
	Association of Applied	cement pastes, P Dohnalik, B	Austria
	Mathematics & Mechanics	Pichler, C Hellmich	
ESR 13	LMC Ski Seminar (Annual	Dissemination of research	Jan 8-10, 2019,
(HTC)	meeting of LMC EPFL and	results	Leukerbad,
	EMPA groups)		Switzerland
ESR 5	39th Cement and Concrete	Sorption Measurements in	Sep 9-10 2019,
(USurrey)	Science Conference	Cement Paste Using Garfield	University of
		Imaging, Ö Istok, PJ McDonald,	Bath, UK
		DA Faux (abstract accepted for	
		poster presentation)	
ESR 7	39th Cement and Concrete	Molecular Dynamic Study of	Sep 9-10 2019,
(USurrey)	Science Conference	Paramagnetic Impurities and	University of
		Water in Hydrates, A Rahaman,	Bath, UK
		DA Faux, PJ McDonald (abstract	
ESR 9	39th Cement and Concrete	accepted for poster presentation) Magnetic Resonance Imaging of	Sep 9-10 2019,
	Science Conference	Water Transport and Drying-	University of
(USurrey)	Science Conference	Wetting Cycles in Cement	Bath, UK
		Pastes, M Janota, PJ McDonald,	batti, OK
		DA Faux (abstract accepted for	
		poster presentation)	
ESR 11	39th Cement and Concrete	Lattice Boltzmann Modelling of	Sep 9-10 2019,
(USurrey)	Science Conference	Water in Models of C-S-H with	University of
(-201)		Dynamic Porosity, M Borg, PJ	Bath, UK
		McDonald, DA Faux (abstract	
		accepted for poster presentation)	

ERICA Exploitation and Dissemination of Results





Software and software models

New capabilities enabled by new modelling software created within ERICA will be widely disseminated (e.g. open pages of the ERICA and Nanocem websites, trade magazine articles, software demonstrations, code available via open data repositories)

We are already creating an Open Access GUI for the numerical modelling interpretation of experimental NMR data (ESR 2 @ UNIBO + USurrey)

Changing practice

Partner MR Solutions are exploring options to make cement-specific equipment. Deliverable D7.4 (due month 48) is a "Good Practice Guide for Magnetic Resonance Imaging of Hydrates"

ESRs 4 & 5 will undertake a secondment at MR Solutions specifically to further this objective

Patents / standards, societal impacts

Expected later in the project

ERICA Progress with Impacts



Enhancing career perspectives and employability of ESRs, contribution to their skills development

Relevant impacts are covered here under research training and secondments

- Research skills, transferable skills, modelling skills, research
 experience, career development planning achieved via Training
 Schools undertaken throughout their project
- Access to industrial supervision and mentoring by ERICA Partners
- Outreach activities
- Participation in project/network open days e.g. ERICA dissemination via Nanocem Open Days
- Networking Nanocem, UK-GRADnet, contact with external researchers and industrials

ERICA Progress with Impacts



Structuring doctoral/ESR training and strengthening innovation capacity at the European level

- The courses offered and the wider ERICA training programme create a defacto European School of Doctoral Training in Hydrate Science
 - ERICA Schools are open to ESRs from across Europe and have been / will be primarily advertised through Nanocem and local hosts
- MOOCs will be developed from lectures in residential Training Schools 1 and 3 (Cement Science and Engineering, Materials Characterisation)
 - The first MOOC has been created: 'Cement Chemistry and Sustainable Cementitious Materials'; the second is in development, to be launched Sept 2020
- The ERICA programme strengthens European innovation capacity by training researchers from different disciplines in multi-disciplinary sciences, cross fertilisation of ideas, introduction of new research technologies
 - Multi-disciplinary research links e.g. to forestry, earth sciences, etc.

ERICA Progress with Impacts



Contribution of the non-academic sector to doctoral/research training

Industry Partners in ERICA provide secondments, mentoring and training:

- Hosting ESRs
- Co-supervision and mentoring of ESRs
- Provision of industrial secondments
- Contribution to transferable skills and technical training via participation in Training Schools and Workshops, e.g. Consultancy Challenge, impact and outreach training

ERICA Follow-up to Interim Review



- Interim project check via videoconference, 26 March 2019, between ERICA consortium and Project Officer included a closed session between the Project Officer and the ESR cohort
- The Project Officer emphasised the value to ESRs of undertaking secondments and commented that planning for secondments was not as well advanced as would be expected at this stage of the project
- The coordinator/consortium has strongly encouraged ESRs to engage with making arrangements for their planned (and additional) secondments; secondment planning is a standing item on the Steering Group meeting agenda
- We anticipate that the majority of secondments will be done, as originally envisaged, during project months 27 to 32 (Jan Jun 2020)
- LafargeHolcim and NTNU have now joined as Partners and will provide additional placement opportunities as well as an alternative for those ESRs who were due to go to FEI to gain industry experience

ERICA Deviations from Annex 1



ESR Matters

- Although around half of the ESR cohort were recruited and started work on their individual projects within 4 months of ERICA's launch, the other ESRs started significantly later
- Hence their progress towards achieving the expected results (as per schedule in Annex 1) has been delayed in some – but not all – cases

ERICA Deviations from Annex 1



ESR Matters

- Project 10 This project has been refocused towards multiscale modelling of chloride transport in cementitious materials (from the original plan of modelling of hydrate microstructure at the particle size/agglomerate level)
- Revised objective To improve the understanding of ionic transport in cementitious materials by building a multiscale model. It will aim to link the nanoscale phenomena to the microstructure and explain how it shows up at the macroscale
- Secondments (due to the departure of FEI from the ERICA Consortium):
 - 1 month at NTNU: Experiment design for validation (month 19)
 - 1 month at NTNU: Engage with thermodynamic modelling and mathematical upscaling (month 31)
 - 2-3 months at HTC: Refine model and validate in an industrial environment (month 34)

ERICA Deviations from Annex 1



Workshop / Training Schools Programme

The programme timetable has been reshuffled (but the content not varied) to accommodate:

- An additional workshop to link back to ITN TRANSCEND
- An additional workshop to better co-ordinate modelling projects
- 1st November start date out of sync. with academic year
- Late start of some ESRs
 - Some ESRs still need to undertake the first part of the numerical modelling school that will not run again until spring 2020

ERICA ESRs' Research Progress



We now move on to science updates from the ESRs