D7.4 Annual Report on Community Building, Event Management, Collaboration and Training

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List of Acronyms

Abbreviation / acronym	Description
AI	Artificial intelligence
CSA	Coordination and Support Action
D2.2	"Intermediate Report on Exploitation and Sustainability Strategy", WP2
D7.2	"Annual Report on Community Building, Event Management, and Collaboration", WP7
D7.3	"Training Concept", WP7
D5.6	"Second HiDALGO Portal Release and System Operation Report", WP5
D4.2	"Implementation Report of the Pilot Applications", WP4
EC	European Commission
GA	Google Analytics
GC	Global Challenges
GCS	Gauss Centre for Supercomputing
GW	Google Webmaster
MP	Migration Pilot
HPC	High performance computing
HPDA	High performance data analysis
ICB	Internal community building
SNA	Social Network Analysis
UAP	Urban Air Pollution
WP	Work Package

Executive Summary

The present deliverable provides an overview over the strategy for external community building, training and dissemination. It lists past and planned dissemination, collaboration and training events. Secondly, it also includes a summary of the recent developments concerning the internal community building.

HiDALGO's strategy for external community building includes an introduction to HiDALGO's offerings, a list of the main target groups for building a community around HiDALGO, a strategy for marketing and collaborations, a training concept and a short characterisation of past and planned events. HiDALGO's offerings include networking, consulting, easy access to resources and case study results. The target groups include big companies, SMEs, researchers and academia, policy makers, public companies, civil societies and additional bodies like open source communities or alliances.

External community building is fostered by the webpage, which includes amongst others a news section and a YouTube channel, regular posts on Twitter, two newsletters per year, flyers, material for contacting stakeholders and a stakeholder survey. HiDALGO collaborates with other projects and initiatives on technical levels, by working on similar topics and / or preparing workshops with joint contributions. The associate partners' scheme includes visibility of the collaboration on the HiDALGO website, subscription to newsletters, invitations to workshops and training events, and exchange of free research results on a case study basis.

One of the main goals of HiDALGO's training task is to create a training curriculum for scientists and analysts to tackle GCs from an intertwined HPC and HPDA perspective. Due to the Covid-19 pandemic, most of the training events since March 2020 have been virtual ones. Training events fall into three categories: innovation and training workshops, web-seminars, videos and online activities, and integrations to the partners' training programs.

The internal community building is fostered by regular phone calls on a WP or topic-specific basis, internal web-seminars, sessions on internal community building at the project meetings, an internal project Wiki, an internal newsletter, the development of a common language and the detailed specification of business aspects.

While the strategy for external community building is in place, the main challenge is the acquisition of new customers in such a broad field as global challenges. The Covid-19 pandemic even aggravates the situation as many scientific conferences have been cancelled or converted to virtual events. On the one hand, in this fashion, a greater audience can be reached, on the other hand many otherwise natural occasions for networking are lost. HiDALGO faces this challenge by offering videos, web-seminars and interactive online workshops at conferences.

1 Introduction

1.1 Purpose of the document

This deliverable reports about the progress towards community building, event management, collaboration and training throughout year two of the project's lifetime.

1.2 Relation to other project work

D7.4 updates D7.2 [3] and D7.3 [5]. WP7 is heavily interwoven with the other WPs, especially WP2 (Business model and Sustainability). Therefore, this document refers to the work of the other WPs when appropriate.

1.3 Structure of the document

This document is structured in 5 major chapters. **Chapter 2** shows the updated roadmap and KPIs. **Chapter 3** presents the strategy for external community building, including training. In contrast, **Chapter 4** addresses the *internal* community building. Finally, **Chapter 5** concludes and lists the next steps.

1.4 Contributions

The main work in each of the work packages was done by the task leaders PLUS, DIA and USTUTT. They worked very closely together and each contributed to all other tasks. All partners contributed to Task T 7.1 (led by PLUS) by providing content for the website and social media, as well as T 7.4 (led by PLUS) by disseminating their results (see also Annex IV).

Several partners contributed to T 7.2 (led by DIA) by providing content for workshops or supporting the organisation (e.g. USTUTT, PLUS, ATOS, BUL, SZE, KNOW, PSNC) and by collaborating with other projects / organisations (e.g. BUL, ATOS, USTUTT, ECMWF, SZE).

Several partners contributed to T 7.3 by providing content for training workshops (e.g. BUL, SZE, PLUS, PSNC, USTUTT, ECMWF, ICCS, KNOW).

A close link to WP2 (Section 3.1) is held throughout the project lifetime between DIA, ATOS and KNOW.

2 Updated Roadmap

Table [1] shows the WP7 roadmap. All tasks are ongoing.

Table [1]: WP 7 Roadmap Month 19 to Month 24

Start	End	WP Task	Description	Responsible Partner
M1	M24	T7.1	Updating the website	PLUS, ALL
M1	M24	T7.4	Communication through social media channels (Twitter, Facebook and ResearchGate)	PLUS, ALL
M12	M24	T7.4	Adaption of communication material for the different areas of application (flyer, poster)	PLUS, ALL
M8	M24	T7.4	Communication through social media - assigning responsibilities w.r.t. time and topic	PLUS, KNOW, BUL, SZE, PSNC, ALL
M6	M24	T7.4	Newsletter	PLUS, ALL
M1	M24	T7.4	Articles in newspapers	ALL
M1	M24	T7.4	Publications	ALL
M1	M18	T7.4	Presentations at conferences, participation in panels	PLUS, ALL
M12	M24	T7.4	Organizing Workshops	DIA, ALL
M1	M24	T7.2	Collaboration with other projects (FocusCoE, EXCELLERAT, POP-2, Cheese)	ATOS, HLRS, ALL
M6	M24	T7.2	Collaboration with the industry	ALL
M6	M24	T7.2	Collaboration with HPC centres (CINECA, BSC)	ALL
M6	M24	T7.2	Collaboration with Networks (GRNET, BDVA, European Network of National Big Data Centers, EU-MATHS-IN network, PIONIER)	ALL
M6	M24	T7.2	Collaboration with academic sector	DIA, ALL
M6	M24	T7.2	Organize webinars	ALL
M6	M24	T7.2	Contacts to different NGOs like MSF, UNHCR, SAROBMED	BUL, ALL
M12	M24	T7.3	Training workshops	HLRS
M12	M24	T7.3	Training workshop for future HPC technology leaders and for Global Challenges scientists and analysists	HLRS

3 Strategy for external community building

HiDALGO's strategy for external community building includes the paragraphs

- HiDALGO's offerings
- Main target groups for building a community around HiDALGO
- How do we get it across to potentially interested persons? Sales, marketing and collaborations.
- Training, concept and events

3.1 HiDALGO's offerings

In WP2 (Business Models and Sustainability) the offerings of HiDALGO to its customers were defined (D2.1, [1]) and updated (D2.2, [2]). The outcome is presented in Figure [1]. The offered services are presented on different levels, starting with the loosest level of professional networking, including the usage of a forum, a match-making service and the option to co-organise a workshop with HiDALGO. The second level represents a more intensive format, in which HiDALGO offers consulting, i.e. to solve the customer's problems without the customer being involved in the computational parts. The most intense level is the level of easy access to the compute resource. This categorization is based on the extensiveness on the use of resources provided by HiDALGO, and the engagement rate. Based on this, different prices schemes may be offered greeting those customers who consume more services or, at least, those with highest prices in order to engage them. On the other hand, the Associated Partner Program (see Section 3.3.2) offered in the lowest level will be used as an engagement tool for attracting new customers or for fostering existing ones to consume more services. The case studies offer services on all three levels, depending on the case studies.

Furthermore, HiDALGO's potential stakeholder types were identified. The stakeholder types were mapped to the offered services to gain an understanding of who needs which services (D2.2).

There is a long list of services that can be offered; however, they were prioritised based on stakeholders' interest. At the same time, the different identified stakeholders were profiled in detail, which is important for developing the appropriate value propositions.

The final list of services to be offered and to whom the services are provided is listed below:

- Consultancy services: Mainly to industry representatives (no matter the industry size), public administrations and civil society, in order to support them on the transition to HPC and foster the use of HiDALGO results.

- Visualization services: Developing or updating workflows adjusted to specific industry or social needs, such as urban development or COVID-19 spread.
- Lighter services: Mainly to SMEs, NGOs or public administrations who cannot afford bigger executions of HPC applications.
- Training: Technical and non-technical: open to industry, academia and society in general, interested in HPC and Global Challenges.
- Certified training: For industry and academia, in a very specific topic and with support of a tutor to gain expertise in the area.
- Applications and codes: Open source or not, to all those developers who want to contribute to the improvement of the technology developed within HiDALGO, or event want to create their own services on top of them.

Figure [1]: HiDALGO's offerings

3.2 Main target groups for building a community around HiDALGO

For building a new HPC-GC community and for involving a new kind of customers, we need to contact different target groups and bring them together. On the one hand we aim to engage with stakeholders who already use HPC / HPDA / AI in the realm of global challenges (e.g. AWI[1], an oceanographic institute which uses e.g. coupled atmospheric and oceanic models). On the other hand, we approach stakeholders who might potentially use HPC with regard to global challenges.

To bring those two groups into a closer contact, HiDALGO prepares a multi-day workshop for July 2021 (see Section 3.3.3).

For training purposes, HiDALGO mainly aims for the HPC / HPDA community, but also offers training for beginners who come from the GC community, in both academia and industry. Many training events on tools and specific software address the needs of personnel internal to the consortium. At the same time, some of these events are of interest for members of other HPC-oriented CoEs, with different levels of experience. HiDALGO also offers training for beginners who come e.g. from the GC community.

Global challenges and potential stakeholders were identified. They are listed in Annex III – List of potential stakeholders.

3.3 Sales, Marketing and Collaborations

3.3.1 Awareness creation

HiDALGO uses several channels to create awareness of its offerings. This is the basis for dissemination and external community building.

Web page

As discussed in D7.2 [3], The HiDALGO Webpage uses Google analytics (GA), as well as Matomo on our own internal servers to have an anonymous, no-cookie option that requires no opt-in. This should reduce the gap between actual users, vs. users who accept tracking

[1] https://www.awi.de/en/science/special-groups/scientific-computing/high-performance-computing.html

cookies. Even Matomo is not perfect, however, as many adblockers can block it as well as a matter of course.

The majority of the data from GA is from January through September 2020. Unfortunately, the Matomo server was inadvertently unreachable during March and April so the data was pulled from May to September 2020.

Firstly, we present some basic numbers from each sight for the period May through September 2020 to establish the large discrepancy between GA and Matomo over the same period.

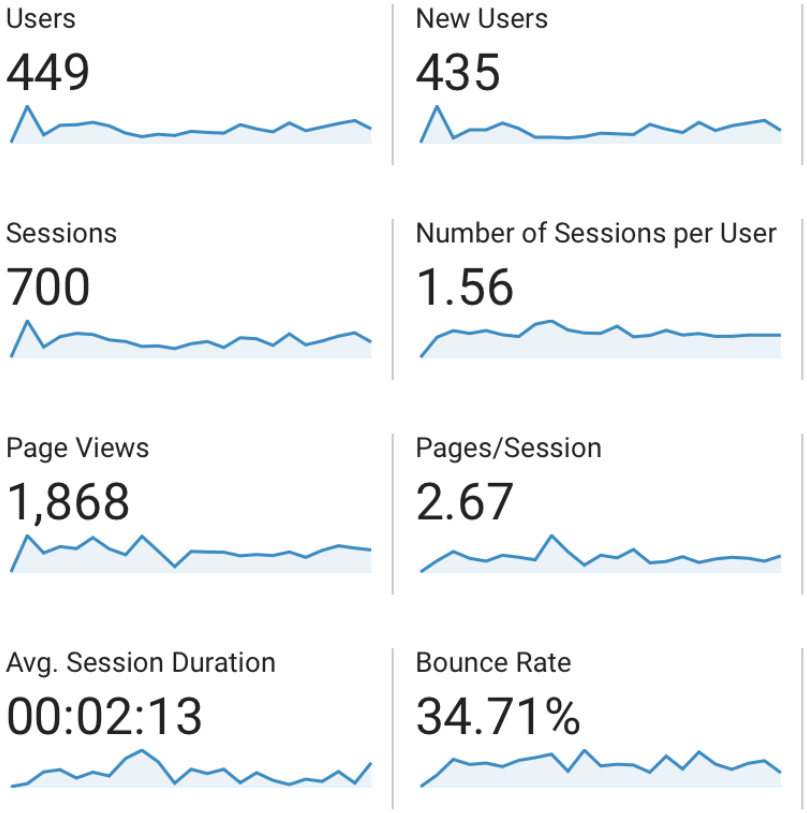

Figure [2]: GA May through September 2020

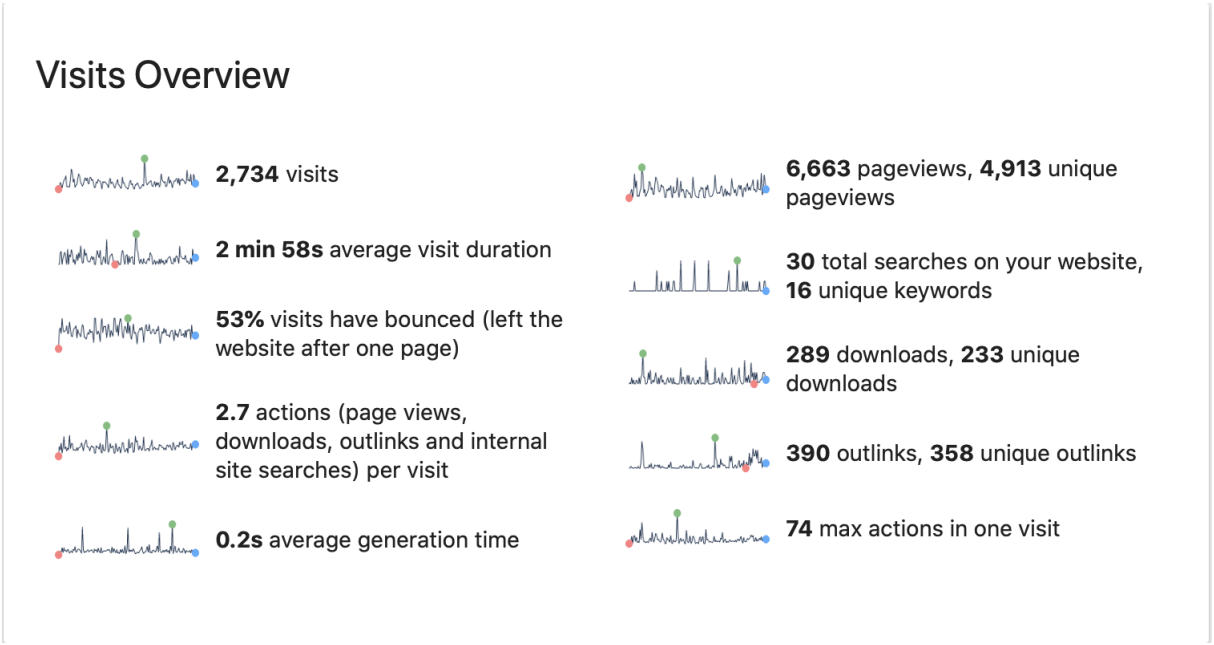

Figure [3]: Matomo May through September 2020

As seen in Figure [2] and Figure [3], GA recorded 449 users, whereas Matomo saw 2,734, about 6 times as many. This can be observed across the rest of the statistics in the figures as well. Matomo has a higher bounce rate, at 53% whereas GA has just 34%. The bounce rate indicates how many users left the website without going to any other page or performing any other action. The GA bounce rate of course can only track the bouncing behaviour of users who agree to the cookie accept banner.

Another source to check a particular section of this discrepancy is the google webmaster console (GW). This tool lets website owners ensure that their website is ranked well in search; it also includes some metrics to show impressions vs. clicks.

GW shows 1,003 clicks and 120k impressions between January and September 2020. In that time period, GA only recorded 177 sessions from Google Search, i.e. not even 1/5 of the total. Matomo's Google Search acquisition shows 650 visits between May and September 2020, whereas GW lists 663. This indicates a much smaller discrepancy, which would mean that Matomo is probably relatively accurate if other acquisition types (direct, other search, social media) all have similarly close ratios between actual visits vs. recorded visits.

As part of GA privacy attempts, GA generally does not receive the keywords used by users of Google Search; GW however does.

The best keywords are listed in Table [2]. Of particular interest is the search for the coronavirus simulator. The Article itself *HIDALGO ESTABLISHES A LOCAL FLU AND CORONAVIRUS SIMULATOR* received 64 visits from Google Search, the third highest in this time period, behind the main landing page, and *About Us.* The fourth page is actually the pdf *D5.1 Hidalgo System*

Enviroment_v1.0. (These direct-to-PDF-finds are not tracked by either Matomo or GA as the JavaScript for the website is not loaded for the PDF. Only when the link to a PDF on the site is clicked it can be tracked).

Table [2]: Keyword usage on the website

Keyword	Clicks
hidalgo project	57
hidalgo	33
flu and coronavirus simulator	17
scientific goals	9
wp4	8

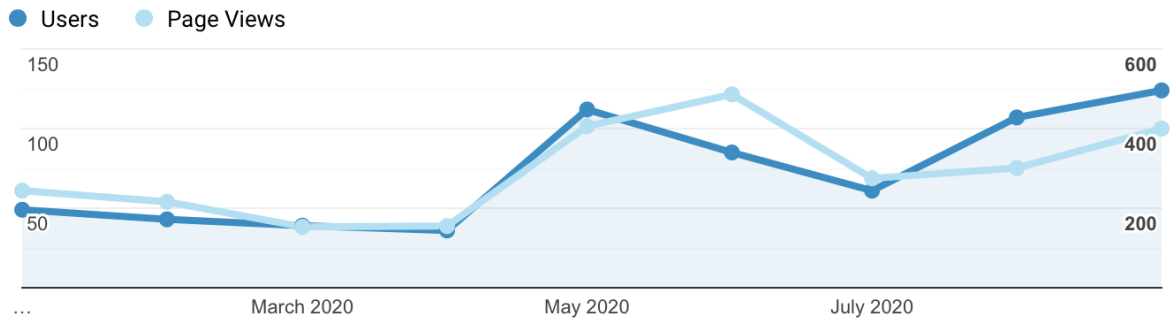

Figure [4]: GA users (left), pageviews (right)

Looking at the traffic per month, Figure [4] shows a slight decline in traffic around February until April 2020 when traffic starts to pick up again. This could be due to the initial measures against the Covid-19 pandemic starting around that time.

Compared to the traffic as seen in D7.2 [3], there continues to be an overall positive trend. Furthermore, the returning visitor rate has increased from 17.8% to 19.7% as seen in Figure [5].

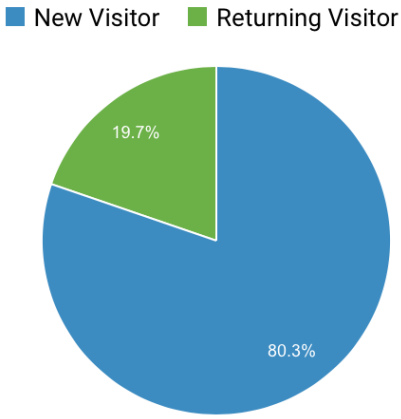

Figure [5]: Ga new vs. returning users

Default Channel Grouping	Acquisition			Behaviour	
	Users	New Users	Sessions	Bounce Rate	Pages/Session
	579 % of Total: 100.00% (579)	569 % of Total: 100.00% (569)	976 % of Total: 100.00% (976)	37.19% Avg for View: 37.19% (0.00%)	2.70 Avg for View: 2.70 (0.00%)
1. Direct	**489** (74.66%)	487 (85.59%)	646 (66.19%)	38.70%	2.51
2. Referral	**77** (11.76%)	51 (8.96%)	125 (12.81%)	26.40%	3.10
3. Organic Search	**73** (11.15%)	26 (4.57%)	177 (18.14%)	39.55%	3.23
4. Social	**16** (2.44%)	5 (0.88%)	28 (2.87%)	35.71%	2.00

Figure [6]: GA channel acquisition metrics

Channel acquisition between Matomo and GA show strong differences (Figure [6] and Figure [7]), with GA recording the massive majority of traffic being Direct Entry, almost 75%, whereas Matomo only has 54% for Direct Entry. Both show social networks as relatively low, 2~4%, but GA has referral (websites) and organic search as essentially equal at around 11%, Matomo has organic search at more than double that, around 30%. Referrals and Social Media both seem to have lower bounce rates, which would make sense given the audience.

CHANNEL TYPE	VISITS	ACTIONS	ACTIONS PER VISIT	AVG. TIME ON WEBSITE	BOUNCE RATE
Direct Entry	54% 1,476	4,046	2.7	3 min 30s	58%
Search Engines	29.7% 811	1,966	2.4	2 min 30s	56%
Websites	12.6% 345	1,155	3.3	2 min 0s	33%
Social Networks	3.7% 102	274	2.7	2 min 20s	32%

Figure [7]: Matomo channel acquisition

Geographically (Figure [8] and Figure [9]) it seems most of the website visitors come from within the EU. Of note perhaps is that Matomo has the US as the top location, but they have an over 90% bounce rate which is not reflected by almost any other location. Otherwise, the top 5 in both otherwise are Germany, UK, Austria, Spain, and Hungary.

COUNTRY	VISITS	ACTIONS	ACTIONS PER VISIT	AVG. TIME ON WEBSITE	BOUNCE RATE
United States	20.4% 557	633	1.1	13s	93%
Germany	19% 520	1,823	3.5	4 min 44s	39%
United Kingdom	13.9% 379	1,037	2.7	2 min 9s	40%
Austria	10.7% 292	1,245	4.3	6 min 57s	25%
Spain	5.1% 140	453	3.2	3 min 47s	42%
France	2.9% 80	215	2.7	2 min 4s	53%
Hungary	2.7% 73	258	3.5	4 min 19s	27%
Italy	2.5% 68	239	3.5	2 min 51s	32%
India	1.7% 46	79	1.7	1 min 14s	74%
China	1.6% 44	62	1.4	22s	89%

Figure [8]: Matomo visits by location

The top pages (Figure [11]) have changed somewhat compared to D7.2 [3]; of course the first page on the list is the main landing page followed by the *about us* page. There are several hub pages (pages aggregate information and can send the user to a more specific page) that have stayed on the list, but of interest is that both Coronavirus simulation articles have made it on the list.

Finally, Figure [10] shows the top 5 downloaded files according to Matomo. It is important to note that, as seen in the Google Webmaster console, direct URL access to pdfs on the server are not able to be tracked by Matomo, leaving the numbers most likely largely undercounted.

Country	Acquisition			Behaviour	
	Users	New Users	Sessions ↓	Bounce Rate	Pages/Session
	579 % of Total: 100.00% (579)	569 % of Total: 100.00% (569)	976 % of Total: 100.00% (976)	37.19% Avg for View: 37.19% (0.00%)	2.70 Avg for View: 2.70 (0.00%)
1. Germany	76 (12.90%)	71 (12.48%)	**198** (20.29%)	39.39%	3.40
2. United Kingdom	102 (17.32%)	101 (17.75%)	**134** (13.73%)	29.10%	2.85
3. Spain	64 (10.87%)	62 (10.90%)	**115** (11.78%)	49.57%	2.45
4. Austria	66 (11.21%)	64 (11.25%)	**112** (11.48%)	31.25%	2.46
5. Hungary	34 (5.77%)	33 (5.80%)	**67** (6.86%)	37.31%	2.46
6. Italy	35 (5.94%)	34 (5.98%)	**48** (4.92%)	43.75%	2.77
7. Poland	10 (1.70%)	10 (1.76%)	**31** (3.18%)	51.61%	2.29
8. France	19 (3.23%)	17 (2.99%)	**28** (2.87%)	42.86%	2.46
9. United States	18 (3.06%)	18 (3.16%)	**23** (2.36%)	34.78%	2.30
10. Greece	14 (2.38%)	14 (2.46%)	**21** (2.15%)	66.67%	1.38

Figure [9]: GA sessions by location

/sites/default/files/2019-04/HIDALGO_D4.1 Initial Status of the Pilot Applications_v1.0.pdf	13
/sites/default/files/2020-01/20200128_Newsletter_2_1.pdf	6
/sites/default/files/2019-03/HIDALGO_D5.1 HiDALGO System Environment_v1.0.pdf	5
/sites/default/files/2020-04/HIDALGO_D7.2 Annual Report_v1.0.pdf	5
/sites/default/files/2020-05/HiDALGO Athens Agenda v0.5.pdf	5

Figure [10]: Matomo top 5 downloaded pdfs

PAGE TITLE	PAGEVIEWS	UNIQUE PAGEVIEWS	BOUNCE RATE	AVG. TIME ON PAGE	EXIT RATE	AVG. GENERATION TIME
HiDALGO | HiDALGO	36.1% 2,406	1,761	51%	00:00:35	65%	0.23s
About Us | HiDALGO	6% 400	291	51%	00:00:47	53%	0.17s
HiDALGO establishes a local Flu And Coronavirus Simulator | HiDALGO	4.8% 323	230	52%	00:01:00	87%	0.23s
Reports | HiDALGO	3.8% 251	123	54%	00:00:38	23%	0.1s
Media | HiDALGO	3.6% 238	145	41%	00:00:44	41%	0.12s
HiDALGO Simulation tool predicts second wave of COVID-19 | HiDALGO	2.6% 174	117	36%	00:00:33	58%	0.15s
Publications | HiDALGO	2.5% 164	107	36%	00:03:10	55%	0.09s
Urban Air Pollution Pilot | HiDALGO	2.2% 149	107	57%	00:01:21	64%	0.17s
Migration Pilot | HiDALGO	1.9% 124	94	49%	00:01:21	53%	0.36s
Core Partners | HiDALGO	1.8% 123	85	75%	00:00:31	28%	0.14s

Figure [11]: Matomo top pages

Twitter and other social media

As our Twitter activity has increased so has our impression counts. The Twitter account has shared access with many representatives of HiDALGO which has immensely increased its activity. Again, there seems to be a correlation between the number of tweets and impressions. Of interest is also what seems to be a slow increase in engagement rate.

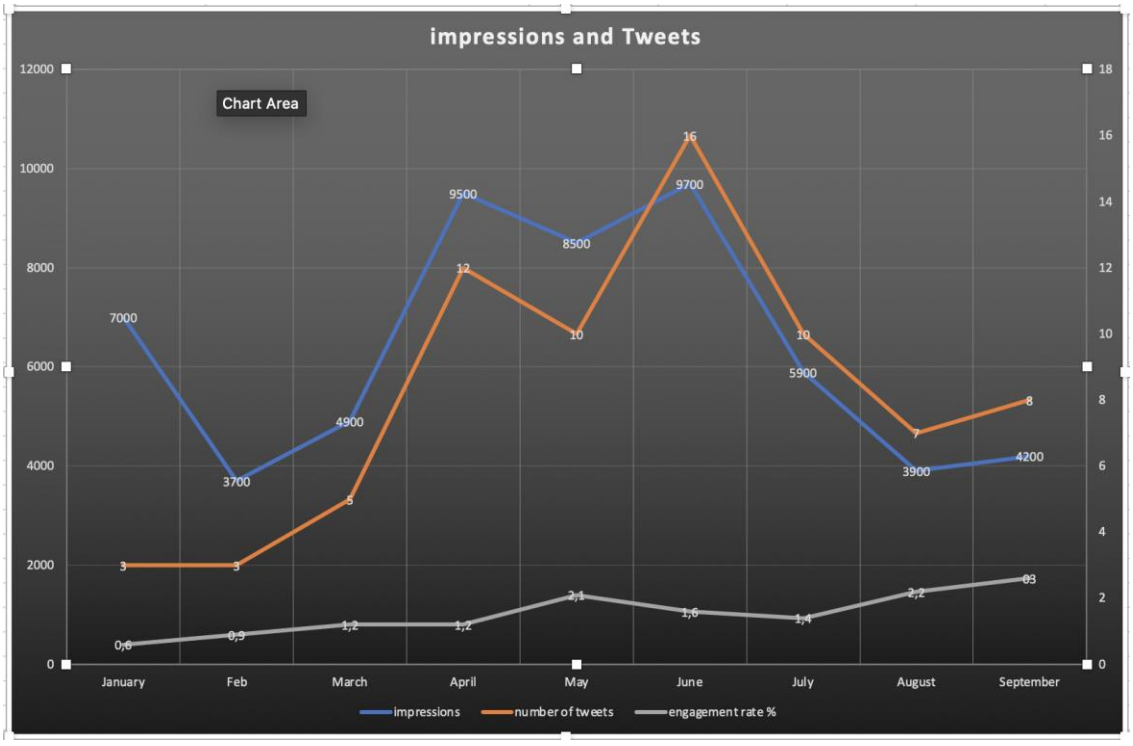

Figure [12]: Twitter impressions and tweets, January to September 2020

HiDALGO also is present on other social media like Facebook and Research Gate and has introduced a YouTube channel.

Newsletters

HiDALGO regularly publishes newsletters about its goals and activities, in which we inform the internal and external community. Furthermore, past and future events are included into the newsletter, which are of interest for the HiDALGO consortium.

Videos

HiDALGO planned to produce short videos during the spring 2020 with the aim to explain shortly what HiDALGO is and what it offers.

Topics envisaged were:

- Aims and vision of HiDALGO. Strengths of the consortium.
- Methods used in HiDALGO. Benefits for our stakeholders of the services offered by HiDALGO
- How can HiDALGO push exascale?
- Description of case studies and benefits for the society.

These videos should have been placed on the website. However, due to the Covid-19 crisis, the videos were cancelled.

Monthly training videos on the case studies are prepared, starting in October 2020. They are described in chapter 3.4.

Dissemination package

HiDALGO has produced a package with dissemination material. It includes

- general HiDALGO flyers in English and German (updated in the light of new developments in the project),
- flyers describing the single case studies
- and also, flyers produced by single partners (e.g. MOON) to encourage their customers to use HPC / HPDA
- presentations about use cases.

Material for contacting potential stakeholders

WP2 has developed a pdf file describing HiDALGO's offerings (see Section 3.1). In addition, WP7 provides several standard letters (researchers, companies, policy makers) for contacting potential users / customers / stakeholders (Annex I – Letter for contacting stakeholders). They are spread through the partners' networks. In addition, as wished by the project partners in M18, standard letters to approach data providers were provided to the case study leaders.

In HiDALGO, different work packages and tasks need feedback from other stakeholders, e.g. training, event management and collaboration and future applications. Therefore, a joint survey was developed asking stakeholders for their needs and if they would use our services (Annex II – Stakeholder survey). The survey is placed on the website and is distributed at workshops and by partners' networks.

3.3.2 Collaboration with other projects and stakeholders

Collaborations of HiDALGO with external stakeholders are manifold. To offer benefits for stakeholders to collaborate with us, we created the possibility for associate partnerships (see below). HiDALGO already has 6 associate partners as of now. These are projects, but in general also institutes or companies could become associate partners.

HiDALGO participates in FocusCoE activities, e.g. joint workshops, but also collaborates with projects, NGOs and city administrations on specific topics on a case study basis. To gain visibility and make HiDALGO sustainable, HiDALGO takes part in alliances and considers creating own alliance(s).

Associate Partner Program

To make it beneficial for projects / institutes / companies etc. to collaborate, we offer them visibility on our website and information on HiDALGO events and newsletters.

Features:

- List logo and description of collaboration on the homepage
- Subscription to newsletters
- Invitations to our workshops and trainings
- Option to take over an active part in our online workshops
- Exchange of free research results on a case study basis

Process:

1. Contact HiDALGO via contact@hidalgo-project.eu or suggestions from the consortium
2. Decision within the consortium
3. Official agreement is sent to the requiring party via e-mail
4. Ask the requiring party to provide their logo and a text about them & our collaboration
5. Upload the text and logo to the webpage
6. Include new associate partner in an e-mail list about newsletters, workshops etc.

Collaboration with FocusCoE

All Centers of Excellence collaborate with FocusCoE, as a support action, in different areas: from dissemination to training or industry uptake. Periodic telcos with the different working groups are scheduled, moderated by FocusCoE, in order to discuss about topics of interest for all CoEs and actions to be undertaken.

Three representatives from HiDALGO have been appointed to participate in the different activities, so the project can benefit for the networking and interaction.

Main results of the collaboration activities are:

- Share best practices on training and disseminate training events organized by CoEs.
- Share the HiDALGO training events on the FocusCoE registry [4]
- Elaboration of an industry survey to analyse the interest of different industry representative on the topics addressed by each CoE. In this sense, HiDALGO gained three direct contacts with different companies to do a follow up and present results to them.
- Participation in the workshop co-organised with FocusCoE at HiPEAC 2021.
- Co-organisation of a session at the EUSEUW where HiDALGO will be represented and discuss the possibility of having a booth.
- Access to industry representatives contacts to present HiDALGO's value proposition.
- Organisation of a two-day online workshop focused on sustainability, where HiDALGO will present its plans and get feedback about success stories from other industry representatives (to be held in November 2020).

HiDALGO also participates in HPC CoE Council (HPC3), a forum of networking and discussion with other HPC CoEs in order to identify common points of interest, challenges and future roadmap. It also provides channels to disseminate main project achievements and results. As part of these activities, HiDALGO collaborates with other CoEs in the development of a business position paper identifying major challenges for the go-to-market strategy and ensuring the sustainability of the centres.

Collaboration with other projects and institutes

Table [3]: Collaboration with other projects and institutes

Project / initiative	Content	Status
BDVA	Booths, publications, webinars, etc. Mainly dissemination activities.	Ongoing
BOSCH	SUMO and sensors	Ongoing
EoCoE	Associate partner. Interested in contributing to our multi-day workshop in July 2021.	Ongoing
EOSC	Contributions to the published booklet about CoEs. Participation in a survey to find common topics of interest. Analysis of potential collaboration activities	Ongoing
EPEEC	Learn about the new versions of libraries and programming models used in the HPC environment (mainly, OpenCL, OpenACC and OpenMP). Software/Software co-design and testing of new HPC solutions.	Contact established, waiting for more information from them
EPiGRAM	Learn about the new versions of libraries and programming models used in the HPC environment (mainly, MPI and GASPI). Software/Software co-design and testing of new HPC solutions.	Contact not established yet
ESiWACE	Associate partner to us and vice versa. Interested in contributing to our multi-day workshop in July 2021. They might provide data which is useful for the UAP case study.	Ongoing
EUXDAT	Level 3 candidate for the Associate Partners Program. Collaboration in the orchestration solutions.	Initial contact established
EXCELLERAT	Associate partner Collaboration on the work on the UAP case study	Ongoing

Project / initiative	Content	Status
	Shared organisation of two web-seminars in the first year of the project (see Section 3.4). HiDALGO contribution to the First joint CoE Technical Workshop (see Section 3.4)	
Future Cloud Cluster	The Future Cloud Cluster has launched a new issue for requesting information from different projects about the foreseen future challenges in the cloud continuum. Possibility of participating in HPC cloud discussions and the similarities with a hybrid computing approach.	Initial contact established
Heterogeneity Alliance	Participation in periodic meetings. Contribution to the Heterogeneity Alliance book in progress. Organization of a workshop in HiPEAC 2021.	Ongoing
HPC3	Contribution to a business position paper. New HPC3 website where all CoEs advertise their services. New working group focused on sustainability training.	Ongoing
Hospital 12 de Octubre (Madrid region, Spain)	One of the main hospitals in the Madrid city. We have presented to them the COVID-19 simulations and we have agreed to prepare a simulation for the health area they manage. We are setting up the simulation and they committed to provide the required input data.	Ongoing
Humdata.org	https://centre.humdata.org/catalogue-for-predictive-models-in-the-humanitarian-sector/	FLEE added to the list of predictive models
ITFLOWS	Associate partner Will use the Flee code to define 5 new simulation scenarios.	Ongoing
IOM	Institute of Migration. We maintain an informal collaboration, and they have provided valuable input in developing our updated ruleset.	Ongoing
NHSx	Uses results from our Covid-19 work.	Ongoing
NUST Islamabad	Uses results from our Covid-19 work	Ongoing

Project / initiative	Content	Status
ODYCCEUS	Associate partner We might contribute to their final conference with a talk on social networks analysis. They might be interview partners for our social networks case study.	Ongoing
POP2	CoE which supports the optimization of applications for HPC. We had conversations about analysing some tool from HiDALGO, in order to provide feedback on how to optimize it.	Preparing collaboration
PRACE	Computing services, Data transfer and storage, Data visualization, Secure access to the HPC infrastructure	Ongoing
Save The Children	A global charity that helps children in need. BUL are co-designing new migration models (i.e. Burundi conflict) and addressing new research questions.	Ongoing
SODALITE	Associate partner. Discussions about technical collaboration, mainly related to resources orchestration. Discussions about business collaboration or how to propose sustainable models for research activities.	Ongoing
UNHCR	UN High Commissioner for Refugees. We collaborate with the UNHCR to provision high quality validation and input data for our simulations.	Ongoing
VECMA	Associate partners vice versa Collaboration on the technical front: VECMA supporting VVUQ activities in HiDALGO with tools and development support, and HiDALGO possibly providing support in HPDA and / or visualisation	Ongoing

Furthermore, HiDALGO contacted other institutes and foundations:

Project / initiative / foundation	Date of contact	Status
Bayrisches Staatsministerium für Wohnen, Bau und Verkehr	31 Aug 2020	Contact person promised to bring it to the ministry to see if there is interest for HiDALGO
Bosch Stiftung	1 Sep 2020	Refusal received via e-mail on 1 October 2020, reason: the foundation is in a restructuring phase and the topics they support change
Graduate Institute Geneva	7 Sep 2020	Waiting for answer, reminders sent on 21 Sep and 30 Oct 2020
Global Challenges Foundation	15 Sep 2020	Contact established
Alfred-Wegner-Institut	22 Sep 2020	Waiting for answer, reminder sent on 30 Oct 2020

Alliances

HiDALGO joined the Heterogeneity Alliance in spring 2020 in order to be able to interact with other projects or organizations, out of the CoEs network, doing research on common topics for HPC and HPDA.

Within this Alliance HiDALGO has the opportunity to showcase its results out of the HPC CoEs arena, reaching a wider not so specialised audience. Main activities can be summarised as follows:

- Contributions to the Heterogeneity Alliance book positioning the European research in the global arena. HiDALGO contributes with the challenges and roadmap of European HPC research.
- Organization of a workshop at HiPEAC 2021. The workshop has a call for presentations and invitations have been sent around in order to encourage other projects or organisations to share their views on the topics of interest for the Alliance.

But HiDALGO is not only focused on collaborating with other alliances but to create its own one. The idea of the Alliance is supported by the Associated Partner Program, level one already explained at the beginning of this section. This level is focused on cross-fertilization and dissemination activities, in order to spread the work done by the project. While Level 2 and Level 3, explained in D2.2 [2], are more focused on attracting external users and potential customers to the offered services.

3.3.3 Dissemination and events

Dissemination activities and events can be found in Annex IV. As of M24 the project partners have produced several journal articles and conference papers, several theses have been finalised in the context of HiDALGO, and about 40 contributions to conferences, symposia and workshops are listed as well as several press releases, non-scientific publications and flyers.

One workshop has been held at the HiPEAC 2020, and two more workshops are planned. One will take place at the HiPEAC 2021. The second is planned as a stand-alone multi-day workshop in July 2021 – hopefully it will be possible to hold it as a physical event.

3.3.4 Next steps

HiDALGO will continue to update the webpage and the dissemination package as appropriate, to be active on Twitter and to publish the newsletter regularly (twice a year).

One main focus of the external community building work is to contact potential stakeholders / associate partners. This will be done, as before, on a case study basis and in parallel on a general project basis.

Several HiDALGO events will take place, e.g. a workshop at the HiPEAC in January 2021, contribution to a FocusCoE workshop at the same event and a multi-day workshop in July 2021. These events are developed in close collaboration with the training task T 7.3.

HiDALGO furthermore disseminates its results, e.g. at conferences and in journal articles.

3.4 Training

The purpose of this section is to sum up the activities of T7.3 by updating the Training Concept presented in D7.3 [5]. This section therefore focuses on the updated strategy and on the next actions that need to be taken, and is concluded by an overview of past and planned events.

3.4.1 Update of concept

One of the main goals of T7.3 is to create a two-fold training curriculum. On the one hand, a curriculum for HPC technology leaders must detail the Global Challenges needs, on the other hand a curriculum for GC scientists and analysists must focus on HPC and HPDA modelling. In the end, the common goal is for the consortium to both acquire and provide tools to tackle GCs from an intertwined HPC and HPDA perspective.

Track "Training on GCs": It can be carried out with different levels of detail considering different audiences: HPC developers, but also HPC users or young scientists. This kind of training refers in general to the pilots' scenarios. In particular, while Migration and UAP were deemed the most mature pilots to provide training at the time of D7.3 [5], some of the activities now listed in Section 3.4.3 refer to the SNA pilot as well (e.g., the HiDALGO Video Series, Training by KNOW and USTUTT). Considering the activities HiDALGO has been organising or attending, GC training for HPC (future) experts can happen in those forms:

- Training activities in the established training program of partners, with integrations of HiDALGO-specific contributions. Here, demonstrations of the pilots or lectures on specific methods used to tackle a GC can be offered. The consortium partners provide training for

different communities (students, researchers and post-graduates, industry) with different levels of HPC knowledge.

- Full multi-day courses aimed at reproducing a specific pilot, where details about the tackled GC can be given, and the developed tools demonstrated with hands-on sessions.
- Recorded videos which include an overview of a GC (Figure [13]), and separate hands-on sessions on the utilised tools, to also increase awareness of the applicability of the HiDALGO achievements. For this, remote access to the platform where the software has been deployed must be set up and granted to the participants.
- Interactive web-seminars where the project mission and one or more pilots are illustrated (with the HiDALGO Portal as a starting point), with extensive space left for questions and discussions.
- Tutorials for specific tools on data processing workflows and multiscale coupling, which are recurrent scenarios within GC simulation (see Section 2.1 of D7.3 [5]).
- Presentations, round tables, panels, and virtual booths at innovation workshops, where HPC scientists are able to approach HiDALGO personnel and establish collaborations on GC themes. Since innovation workshops have further goals beyond training (collection of feedback, dissemination and outreach, etc.), they are mostly monitored by T7.2 and listed in Section 3.3.3

Figure [13]: Overview video "COVID-19 Simulation" by BUL.

Track "HPC and HPDA training": This training for GC scientists can take advantage of HiDALGO partners' expertise in terms of HPC and HPDA (Big Data, Machine/Deep Learning, Artificial Intelligence, etc.). The partners are prompted to contribute HiDALGO-specific training sessions on new tools and developed techniques. Towards the end of the project, the consortium envisages to offer complementary training resulting from the optimised codes of the pilots.

Specific topics can be narrowed down in two ways. First, the stakeholders' and training participants' survey (next section) is an indication of the demand for training on general HPC and AI topics. On the other hand, the project strives to provide a curriculum tailored to the pilots' technical needs. Therefore, the gaps in HPC and HPDA knowledge of experts working on GCs have been identified and listed in Section 2.1 of D7.3 [5]. Taking these facts into account, HPC and HPDA training can happen in those forms:

- Training activities in the established training programs of partners, integrated with training on tools specifically used within HiDALGO, ideally corresponding to the needs listed in Section 2.1 of D7.3 [5].
- Web-seminars or workshops on topics directly emerging from the listed requirements, e.g. on tools for high-performance data-storage (CKAN) or agent-based modelling and simulation (Flee).
- HPC on-site or online training and training material, on platforms where the pilots' software has been deployed (e.g. the PSNC platform). Remote access and technical support should be provided.
- Advanced HPC training sessions in more general HPC courses, to focus on benchmarking procedures, optimisation, and coupling (also applied to the pilots).
- Training on HPDA with direct application to techniques used within the pilots, or training on AI components developed in the project.
- Specific training on obtaining, using and understanding weather data, which are relevant in many GC simulations (e.g. Migration and UAP). ECMWF is the natural partner for this endeavour. They also develop training on Jupyter Notebooks and on cloud computing.

Together with the innovation workshops (Section 3.3.3), the activities described in Section 3.4.3 are focused on education and are the fundamental part of the two-track curriculum. Also training on tools such as scheduling or version control are part of the curriculum. Even though they cannot be ascribed to a particular track, they are certainly useful to the project and possibly to other CoEs.

Training activities and innovation workshops must keep up their frequency and quality standards, in spite of restrictions and bans imposed by the Covid-19 pandemic. Web-seminars, already part of the curriculum, have been intensified, but also new formats have been proposed, in particular to allow the interaction between HiDALGO and a broader audience.

For example, during HiPEAC 2021 [6], an interactive website is being planned, which will run in parallel to the conference on the HiDALGO website. While digital posters will introduce the public to the pilot's essentials, visitors will be able to make an appointment to interact with a HiDALGO expert.

HiDALGO training events are promoted through different channels, among them the internal project Wiki and newsletter (see Section 4.1.3), but also the Euro-HPC training registry (embedded in the HiDALGO website [4]), and HiDALGO-internal and inter-CoEs mailing lists to foster collaboration (Section 3.3.2).

3.4.2 Next steps

Both HiDALGO's training curricula must be tuned to the training requirements. These are listed both as HPC/HPDA requirements of GC applications in Section 2.1 of D7.3 [5], and as results of a training questionnaire. The latter has been thought as one part of the requirement analysis compiled by T7.1 (Awareness Creation and Community Support) and T7.2 (Event Management and Collaboration) to investigate the stakeholders' needs in terms of HPC and HPDA knowledge (see Annex II – Stakeholder survey). Then, the questionnaire addressing training needs has also been included in the quality survey distributed after each training (when possible). The results so far are displayed in Figure [14], where the columns correspond to the (possibly multiple) answers to the question "HiDALGO can offer training in various domains. Which specific topics would be most interesting for you?"

- Introduction to Global System Sciences and its challenges
- Introduction to HPC: A beginners' guide
- High-performance computing (HPC) vs. Cloud. When to use what?
- Developing for HPC, using parallelisation techniques
- HPC Code optimisation for HPC
- Applying artificial intelligence to get new insights from my data
- Introduction to specific application areas: Migration
- Introduction to specific application areas: UAP
- Introduction to specific application areas: SNA

In Section 3.4.3 we therefore indicate whenever a training event responds to a particular training need according to the top-three in the diagram: Applying Artificial Intelligence, HPC using parallelisation, Introduction to HPC and Code optimisation for HPC (ex-aequo).

Further comparison material is provided by the training assessment performed within other HPC-oriented CoEs (e.g. EXCELLERAT, FocusCoE), and the training map that will be developed within the CSA for the National Competence Centres (CASTIEL, see [7]).

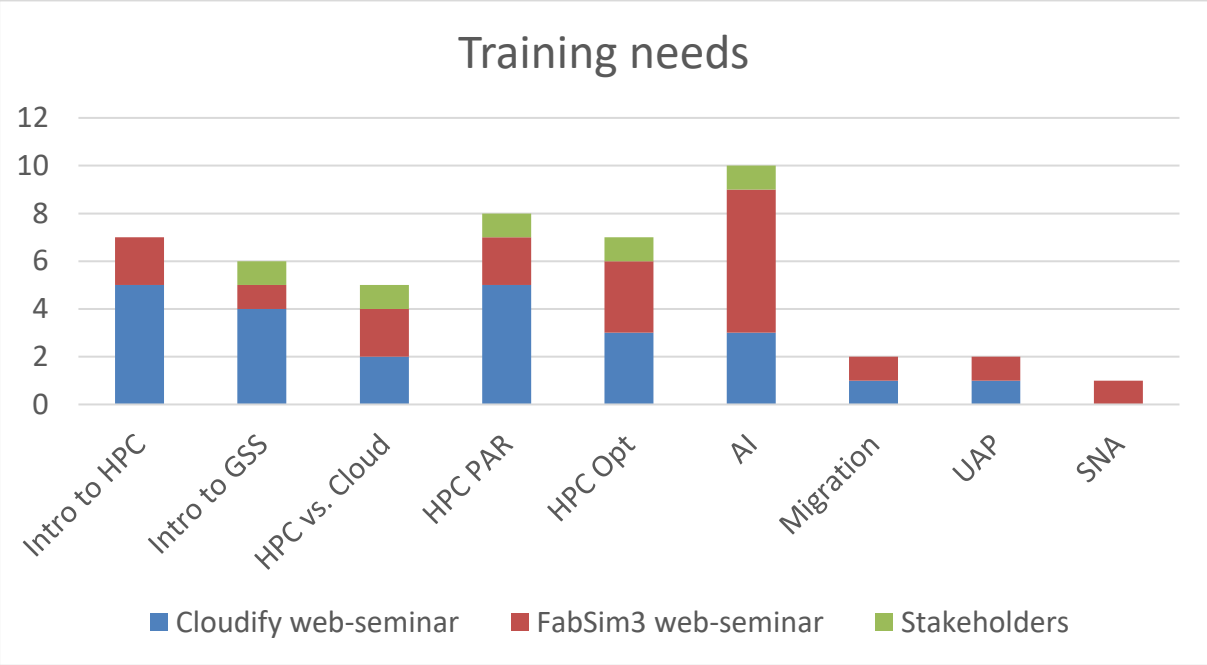

Figure [14]: Results of the Training survey at M23.

The training formats adopted to face the Covid-19-related limitations will still be present throughout Y3, both as a necessity and to maintain their positive outcomes: Web-seminars allow for a larger and more diverse participation, which therefore supports HiDALGO's striving for inclusivity (see D7.3 [5]). Of course, trainers face augmented challenges in developing practicable hands-on sessions and stimulating content for a remote audience.

As thoroughly described in D7.3 [5], a Moodle [8] has been set up and integrated with the portal by WP5. Here, courses can be conducted and training material can be accessed and shared in a structured and interactive way. Nevertheless, Moodle has been so far mostly utilised as a repository, while its functions of scheduling and support to teaching in different formats have a much greater potential. The publication of recording material of the web-seminars will also have to be optimally handled among the different available channels (Moodle itself, but also the GoToWebinar archive [9], the HiDALGO YouTube channel [10], the HiDALGO website [11] and the Portal [12]).

3.4.3 Overview of HiDALGO training events

The HiDALGO T7.3 curriculum consists of activities focused on education. Among them, a number of HiDALGO-specific training sessions are integrated within the partners' established curricula of workshops and courses. Innovation workshops are also a fundamental part of the curriculum (see D7.3 [5]), even though they have further goals beyond training (collection of feedback, dissemination and outreach, etc.).

In summary, performed and planned activities can be found in the tables below:

- Table [4] to Table [6]: Innovation and training workshops,
- Table [7] to Table [13]: Web-seminars, videos, and online activities,
- Table [14] to Table [20]: Integrations to the partners' training programs through HiDALGO-specific initiatives.

Together with other details, for each activity, the curriculum track is indicated:

- Global Challenges needs for HPC technology leaders (7 events)
- HPC and HPDA modelling for Global Challenges scientists and analysists (8 events)
- Other: event of interest for both communities, or training on tools useful to the project or to other CoEs (3 events) and also whether the activity satisfies a particular training requirement among:
- the top-three ranking in Figure [14]: Results of the Training survey at M23.,
- the list of HPC/HPDA requirements in GC applications in Section 2.1 of D7.3 [5].

Innovation and training workshops

Table [4]: 1st Flee Workshop, Adama Science and Technology University

	1st Flee Workshop, Adama Science and Technology University
Curriculum Track	HPC and HPDA modelling
Type / format	Training workshop, Moodle material
Aim	Dissemination of Flee code, training, advertise HiDALGO work, try to get potential users for the case study, build up collaboration with the University of Adama.
Venue & date	Adama, Ethiopia, 16-18 July 2019.
Target group	Mostly academics (25 participants from the University of Adama)
Training requirement addressed	Agent-based modelling and simulation tools.
Content	Day 1: Python Software Carpentry Day 2: Introduction to Flee code, coupling and validation; tutorial "Design and Prototype your own Agent-based Simulation"

	1st Flee Workshop, Adama Science and Technology University
	Day 3: Hackathon around simulation building A tutorial on the usage of Flee has been made available on Moodle afterwards.
Impression	The tutorials were well-received, and the format of the three-day event was an effective way to raise awareness and develop skills among the participants. Positive feedback has been received from several humanitarian organisations, including the UNHCR and the International Organization of Migration [13], which are currently being involved in the HiDALGO efforts to bolster the Migration case study. More training courses are planned in collaboration with the University of Adama, although political uncertainties and the COVID-19 pandemic represent serious obstacles.

Table [5]: HiPEAC 2020 (hands-on session)

	HiPEAC2020 (hands-on session)
Curriculum Track	Global Challenges
Type / format	Hands-on tutorial, Moodle material
Aim	Provide a demonstration and a hands-on tutorial of the UAP.
Venue & date	Bologna, Italy, 21 January 2020.
Target group	HPC experts from academia, PhD students, and industry representatives (about 35 participants).
Training requirement addressed	Introduction to HPC, Coupling simulations across data centres.
Content	Overview of the UAP challenge, simulation with OpenFOAM® in HPC, basics of blueprints and web interfaces, deploying and executing jobs in HPC. All written material and a video have been made available through the Moodle afterwards.
Impression	In the concluding discussion, a constructive interaction with the CoE EXCELLERAT about the UAP was initiated, the audience showed interest in the SNA pilot, and contacts between project members and industrial stakeholders were established.

Table [6]: EXCELLERAT First Joint Technical Workshop

	EXCELLERAT First Joint Technical Workshop
Curriculum Track	HPC and HPDA modelling
Type / format	Remote or mixed-format workshop
Aim	Provide training to the consortium members and externals.
Venue & date	USTUTT (online), Jan 2021.
Target group	Academia and industry representatives, within the consortium and from other CoEs.
Training requirement addressed	No HiDALGO-specific requirement addressed, since the event is organised by another CoE.

	EXCELLERAT First Joint Technical Workshop
Content	HiDALGO will contribute to this workshop together with EXCELLERAT, ChEESE, and a few guest speakers, in particular in the following sessions: load balancing (PLUS), in-situ visualisation (UAP by SZE and USTUTT), co-design (ICCS and PSNC). The format of the workshop will allow for exchange and interaction among CoEs experts on these topics.

Web-seminars, videos, and online activities

Table [7]: Introductory Webinar on OpenProject

	Introductory Webinar on OpenProject
Curriculum Track	Other
Type / format	Web-seminar
Aim	Explain features of OpenProject (an online project management tool), provide hands-on and best practices to use this tool within HiDALGO.
Venue & date	Online, 2 August 2019.
Target group	Mostly academia, Industry (HiDALGO and EXCELLERAT partners)
Training requirement addressed	Training on tools useful for managing the project.
Content	The goal of OpenProject is to manage all the technical activities within the WPs following the principles of ASD.
Impression	The web-seminar was well received: Afterwards, all WP leaders created sub-projects within the HiDALGO main project to manage their activities by following the Agile Software Development (ASD) principles. After this kick-off, OpenProject has actually played a minor role in the HiDALGO management. Nonetheless it is actively used by EXCELLERAT, which co-hosted the workshop.

Table [8]: Best Practice Guide for Git & Jenkins

	Best Practice Guide for Git & Jenkins
Curriculum Track	Other
Type / format	Web-seminar
Aim	Explain the basic features of Git and Jenkins, provide hands-on and best practices to use these tools within HiDALGO.
Venue & date	Online, 31 October 2019.
Target group	Mostly academia, Industry (HiDALGO and EXCELLERAT partners).
Training requirement addressed	Training on tools for faster and collective developers' work.

	Best Practice Guide for Git & Jenkins
Content	Jenkins and Git, hosted at USTUTT, are tools to safely manage the source code of the project and to automate software development. After the Git web-seminar, a central repository has been created for all the HiDALGO tools and technologies to manage the corresponding code.
Impression	HiDALGO developers are now actively using the Git repository to manage their source code. HiDALGO portal development follows Continuous Integration and Deployment (CI/CD), so the developers are actively using Git to automate the portal components deployment and testing.

Table [9]: Cloudify Blueprint Preparation, CKAN API Usage

	Cloudify Blueprint Preparation, CKAN API Usage
Curriculum Track	HPC and HPDA modelling
Type / format	Web-seminar, Moodle material
Aim	Mostly internal web-seminar to explain the tools Cloudify and CKAN.
Venue & date	Online, 7 May 2020.
Target group	17 participants from the consortium.
Training requirement addressed	High-performance datastores and distributed file systems.
Content	Introduction to Cloudify (to help pilots to prepare Blueprint to define their workflow), and to CKAN (for managing their data). All written material has been made available through the Moodle afterwards. Cloudify usage documentation is available at [15].
Impression	General measured satisfaction of 7.68/10. It was advised to plan more time for such web-seminars, and to additionally provide a written "how-to" guide. Cloudify is actively used within the projects to define the workflow of the Migration and UAP Pilots, and of the COVID-19 use-case applications.

Table [10]: Tutorial FabSim3 and Muscle3

	Tutorial FabSim3 and Muscle3
Curriculum Track	Global Challenges
Type / format	Web-seminar, Moodle material
Aim	FabSim3 and MUSCLE3 will help the HiDALGO project, specifically in the integration with WP5 orchestration, and also be beneficial for other projects involving scientific simulations.
Venue & date	Online, 30 June 2020.
Target group	15 participants from the consortium partners, as well as the projects ESiWACE2, EXCELLERAT, E-CAM and VECMA.

	Tutorial FabSim3 and Muscle3
Training requirement addressed	Agent-based modelling and simulation tools Coupling simulations across data-centers
Content	FabSim3 and MUSCLE3 are tools for data processing workflows and multiscale coupling: ▸ FabSim3 is a Python-based automation toolkit for scientific simulation and data processing workflows. It supports the use of simple one-liner commands to enable execution of simulation and analysis tasks on supercomputers, establish and run coupled models using the workflow automation functionalities, organize input, output and environment information, creating a consistent log and making it possible by default to repeat/reproduce runs and perform large ensemble simulations (or replicated ones) using a one-liner command. ▸ MUSCLE 3 is the third incarnation of the Multiscale Coupling Library and Environment, and the successor to MUSCLE 2. Its purpose is to make creating coupled multiscale simulations easy, and to then enable efficient Uncertainty Quantification of such models using advanced semi-intrusive algorithms. All written material has been made available through Moodle afterwards.
Impression	General measured satisfaction of 7.56/10. It was advised to adopt a slower pace for effective "hands-on" sessions. The organisation of the event was well-received.

Table [11]: Presentation of the HiDALGO Portal

	Presentation of the HiDALGO Portal
Curriculum Track	Other
Type / format	Web-seminar
Aim	Mostly internal web-seminar to share the 2nd HiDALGO portal features within the consortium.
Venue & date	Online, 7 December 2020 (tentative).
Target group	Internal to the consortium.
Training requirement addressed	Bringing the consortium up-to-date on the portal's functionalities.
Content	The goal of this web-seminar is to demonstrate various features of the portal to get feedback for the improvements in the portal development. The second version of the portal supports Single Sign-On with Keycloak IDM to access various services in a single place (Cloudify, CKAN, Moodle, Wiki, Zammad, Askbot and JupyterHub). The new features and complete web-flow will be detailed in this web-seminar. See D5.6 [12] for more details.

Table [12]: HiDALGO HPC/HPDA and Global Challenges

	HiDALGO HPC/HPDA and Global Challenges
Curriculum Track	Global Challenges
Type / format	Web-seminar, interactive
Aim	Present HiDALGO and foster discussion with the external public, especially to replace community and training events cancelled due to the COVID-19 pandemic.
Venue & date	Online, early 2021.
Target group	Greater public of academia and industry representatives, mostly outside the consortium.
Training requirement addressed	None, since this activity is mainly directed to a public outside of the consortium.
Content	The HiDALGO mission and the three pilots will be presented, as well as the HiDALGO portal (following the internal web-seminar on this subject in Table [11]). Greater space will be left for questions and discussions.

Table [13]: HiDALGO Video Series

	HiDALGO Video Series
Curriculum Track	Global Challenges
Type / format	Videos, Moodle material
Aim	Present the HiDALGO pilots through an overview and a hands-on session for each, in order to increase awareness also of the applicability of the HiDALGO achievements.
Venue & date	Online, autumn 2020 to spring 2021.
Target group	Academia and industry representatives, within and outside the consortium.
Training requirement addressed	Code optimisation for HPC.
Content	The plan consists of four pairs of videos, both a pilot overview and a hands-on session. An additional use-case will be included, in order to eventually have the following set-up: UAP (SZE and USTUTT), Migration and COVID-19 simulations (BUL), SNA (PLUS), Exascale HPC and HPDA System Support (PSNC). The overview videos are expected in a monthly cadence starting in October 2020, split into a 3-5 minutes' "teaser" and a 20-35 minutes' main part (suggested timing). They will appear on the HiDALGO YouTube channel and website. The hands-on videos are expected after the overview series, and will include a simulation of one aspect of each pilot. The most appropriate platform will be chosen accordingly (e.g. among the PSNC Virtual Machines, the HLRS infrastructure, the HiDALGO portal), to which participants will apply for remote access after the video publication. The videos themselves as well as written instructions will be available on the Moodle training platform.

Integrations to the partners' training programs through HiDALGO-specific initiatives

Table [14]: Training by ECMWF

	Training by ECMWF
Curriculum Track	HPC and HPDA modelling
Type / format	Online training
Aim	Provide training to the consortium members and externals.
Venue & date	Online, autumn 2020.
Target group	Academia and industry representatives, within and outside the consortium.
Training requirement addressed	Support for Python.
Content	In autumn 2020, ECMWF will provide training on using and understanding ECMWF data, as well as on the use of the ECMWF REST APIs [16] for obtaining data (the Weather and Climate Data API – WCDA [17], the Copernicus Climate Data Store API [18], and Atmospheric Data Store API). This training will be provided to HiDALGO partners working on the Migration (BUL) and UAP (SZE) Pilots, as well as to partners working on integrating HiDALGO workflows within the HiDALGO framework (PSNC, USTUTT, and ATOS). The training will consist of 2 one-hour training sessions: 1. Introduction to weather, climate and environmental data - what data is available and where to find it. 2. Manipulating and visualising weather, climate and environmental data. ECMWF have been developing a set of tutorial Jupyter Notebooks on obtaining, manipulating and visualising weather, climate, hydrological, and air quality data, aimed at users beyond the meteorological community. A first version has been shared with HiDALGO partners to help them work with the data (ownCloud). An updated version of the Notebooks together with a presentation will soon be made available on Moodle. Cloud computing training on the European Weather Cloud (mentioned in in D7.3 [5]) has been postponed. Nonetheless, the European Weather Cloud can be accessed through Cloudify, for which training has already been provided (web-seminar "Cloudify Blueprint Preparation, CKAN API Usage" in Table [9]). ECMWF also plans to provide data for specific periods or areas of interest, to support the HiDALGO consortium in training events or workshops. If needed, ECMWF will contribute with dedicated training sessions.

Table [15]: Training by ICCS

	Training by ICCS
Curriculum Track	HPC and HPDA modelling
Type / format	Online and on-site training
Aim	Provide training to the consortium members and externals.
Venue & date	School of Electrical and Computer Engineering, National Technical University of Athens (NTUA), Greece, autumn 2020 to the end of the project.
Target group	Academia representatives, mostly outside the consortium at the NTUA.
Training requirement addressed	Introduction to HPC, Code optimisation for HPC, HPC using parallelisation, Applying Artificial Intelligence, Graph-analytics operations.
Content	ICCS will integrate HiDALGO-related HPDA techniques and results into the following under- and postgraduate courses offered by the National Technical University of Athens: ▸ Parallel Processing Systems: This undergraduate course is offered every winter semester (in 2020 entirely online). ICCS will incorporate a lecture on the HPC benchmarking procedure used in the HiDALGO project, focusing both on tools (such as ScoreP for profiling/tracing and Vampir for visualization) and best practices, and showcasing the pilot optimizations developed during the project. Further, ICCS will present the weak and strong mechanisms used by HiDALGO in order to couple simulations from different subdomains. Hands-on sessions will be complementary to the lecture, and will focus on code benchmarking and optimization. ▸ Parallel Computations and AI: This postgraduate course is offered every spring semester. Similarly, to the "Parallel Processing Systems" undergraduate course, ICCS will incorporate to this course a lecture on the HPC benchmarking procedure, focusing both on tools and best practices and showcasing the developed pilot optimizations. Further, ICCS will present any AI components developed in the HiDALGO project, such as the "Location graph extraction" component developed for the Migration Pilot, and showcase them as examples of how AI can improve an application's lifecycle handling.

Table [16]: Training by KNOW

	Training by KNOW
Curriculum Track	HPC and HPDA modelling
Type / format	Online and on-site training
Aim	Provide Artificial Intelligence training to the consortium members and externals.
Venue & date	On-site or online, 2021 (to be established).
Target group	Academia and industry representatives (with a strong technological/mathematical background), within and outside the consortium.
Training requirement addressed	Support for Python, Applying Artificial Intelligence, Graph-analytics operations.

	Training by KNOW
Content	KNOW currently offers an AI training curriculum, which includes the following teaching activities: Big Data and ML, Knowledge Discovery and Data Mining, Statistics and Data Mining, Introduction to Data Science and AI. Furthermore, the tutorial "AI Essentials Training" (presentations and hands-on exercises) mainly targets team and project leaders, innovation managers, process owners, and system administrators. In 2021, selected events will be adapted to the specific training needs of the consortium itself as well as external stakeholders, especially researchers, in terms of how methods from AI can be used to support the use cases in the HiDALGO project. Current plans include a half-day hands-on training session (five slots à 45 minutes) to demonstrate techniques for the "Analysis of Social Networks"; though this training is meant to create a general understanding for analysing networks, it will contribute to better understand the role of AI in supporting the SNA pilot. **Teaching method:** Several short lectures (20 minutes) with subsequent hands-on exercises to implement theoretical concepts; the tutor will guide participants as they work towards solutions being provided with code skeletons. Prerequisites include basic programming skills in Python and math skills. Provided materials encompass (i) the slide deck and (ii) the program skeleton (part of a Jupyter Notebook) in combination with specifications for the conda environment (software management). Hands-on will be carried out on the local systems of the participants using freely available datasets. **The training contains following topics:** ▸ Concept of a graph - Equivalent representation of a graph (matrices, edge lists, etc.) - Graph types such as undirected vs. directed, bipartite, weighted, etc. - Graph measures such as vertex metadata, centralities, etc. ▸ Community Detection ▸ Graph creation from raw data ▸ Graph Visualization **Expected learning outcomes:** (i) a basic understanding of the concept of a graph, (ii) knowledge of available quantitative measures for network analysis, (iii) capabilities to visualize graphs, (iv) capabilities to transform a graph into equivalent representations and vice versa, as well as (v) a basic understanding of Python libraries for network analysis. Still open options to offer this workshop are the ISC High Performance 2021 [19] (as a tutorial), the Multi-day Workshop (Section 3.3.3), or as a standalone event.

Table [17]: Training by PSNC

	Training by PSNC
Curriculum Track	HPC and HPDA modelling
Type / format	Moodle material
Aim	Provide training to the consortium members and externals about basics of HPC systems, their usage and development.
Venue & date	Online, July 2020.

	Training by PSNC
Target group	Academia and industry representatives, within and outside the consortium.
Training requirement addressed	Introduction to HPC, Code optimisation for HPC, HPC using parallelisation.
Content	As all pilots' codes are run in an HPC environment, it is necessary to provide basic knowledge about those systems to anyone intending to use them. PSNC online training utilises a computing infrastructure, where all applications, corresponding libraries, and tools necessary to demonstrate the pilots' functionalities have been deployed and configured. PSNC training in particular covers the following topics: ▸ Introduction to the purposes of HPC computing and overview on basic principles: Main components of HPC systems, working with queue systems, different kinds of parallelisms on a supercomputer. ▸ SLURM workload manager tutorial. ▸ Performing computations on HPC system. ▸ Resource management. ▸ Topological optimisation and parametric optimisation. This material for self-learning was conceived as an introductory step for HiDALGO members, as well as for potential customers, to use HPC systems, in particular the PSNC training infrastructure. An HPC Usage Tutorial has already been made available on the online training system Moodle.

Table [18]: Training by SZE

	Training by SZE
Curriculum Track	Global Challenges
Type / format	Online and on-site training
Aim	Provide training to the consortium members and externals.
Venue & date	On-site (SZE) or online, January 2021 (developers' training) and March 2021 (users' training).
Target group	Academia and industry representatives, within and outside the consortium.
Training requirement addressed	Introduction to HPC, Applying Artificial Intelligence.
Content	SZE will prepare and deliver two training events: one for developers addressing consortium members, and one for (mainly) external stakeholders. The UAP developers' training focuses on all the details of the UAP workflows, data sources, databases, and interfaces. Aim of the training is to bring developers of connecting functionalities (related to visualisation, HPDA, and AI support) of the HiDALGO infrastructure to deeply understand UAP, thus providing an opportunity to efficiently develop the CoE tools. The UAP users' training aims at external stakeholders: city policy makers, environmental specialists, politicians, and civils who are interested in UAP modelling. The course will consist of the following chapters: 1. Basic concepts of modelling, simulation, HPC, AI, and data analytics. 2. The HiDALGO infrastructure, tools, and the portal.

	Training by SZE
	3. The air pollution challenge and the air quality directives of the European Commission. 4. The UAP workflows. 5. Hands-on tutorial on UAP simulations. Upon interest, the users' training can be offered repeatedly. In addition, separate videos on each training chapter will be recorded, and disseminated through the HiDALGO website and Moodle. The videos for the developers' training will be available only for internal users.

Table [19]: Training by USTUTT-1

	Training by USTUTT-1
Curriculum Track	Global Challenges
Type / format	Online and on-site training
Aim	Provide training to the consortium members and externals.
Venue & date	USTUTT or online, late 2020 or from 2021 on.
Target group	Academia and industry representatives, within and outside the consortium.
Training requirement addressed	Methods for the SNA pilot.
Content	As by D7.3 [5], HiDALGO plans to integrate original contributions in the following courses: ▸ Iterative Linear Solvers and Parallelisation: A lecture and a hands-on session by Robert Elsässer (PLUS) on computing eigenvalue histograms (i.e., eigenvalue estimators) of large-scale sparse symmetric matrices with PETSc. This method is applied to large scale networks in the SNA pilot. This course could not be offered either in an online or a presence format in 2020. It will be offered (without the parallelisation part) on March 8-10, 2021. ▸ CFD with OpenFOAM®: Current plans include a brief presentation of the UAP, in particular the results obtained with OpenFOAM®. The audience is then referred to the UAP HiDALGO spokespersons for further information and details. This course could not be offered either in an online or a presence format in 2020, but will run online in 2021.

Table [20]: Training by USTUTT-2.

	Training by USTUTT-2
Curriculum Track	HPC and HPDA modelling
Type / format	Online and on-site training
Aim	Provide training to the consortium members and externals.
Venue & date	USTUTT or online, late 2020 or from 2021 on.
Target group	Academia and industry representatives, within and outside the consortium.

	Training by USTUTT-2
Training requirement addressed	HPC using parallelisation, Support for Python.
Content	As by D7.3 [5], HiDALGO plans to integrate original contributions in the following courses: ▸ Parallel Programming Workshop (MPI, OpenMP and Advanced Topics). The MPI Python API is being added to the Fortran and C/C++ ones, to bring the participants closer to some packages extensively used within HiDALGO (MPI for Python [20], Dask. distributed [21]). Such an addition is a work in progress, and will be included in one of the parallelisation courses at USTUTT or at a GCS [22] location in late 2020 or 2021.

4 Internal community building

4.1.1 Introduction

When many scientists with different disciplinary background convene to solve a complex problem in an interdisciplinary way, this is not trivial. As Nicolson et al. ([23], pp. 377-378) state: "Indeed, there are many challenges and obstacles that must be addressed before a variety of scientists can work together effectively in an interdisciplinary mode." This is due to the disciplinary education of experts, which leads to a discipline-specific view on the world.

Deliverable D7.2 "Annual Report on Community Building, Event Management, and Collaboration" provides an introduction to the topic and shows the developments during the first year of HiDALGO. The present deliverable updates the developments during the second year (including the plenary meeting in M 12, and excluding the plenary meeting in M 24).

To our understanding, internal community building in HiDALGO includes (this list is not comprehensive):

- Exploiting the chances offered by interdisciplinarity, especially fostering integration
- Supporting the development of an internal community and smoothing the way for a fruitful collaboration within HiDALGO
- Observing the internal community building (accompanying research) and feeding back the observations to the consortium
- Providing dedicated sessions at plenary meetings
- Developing recommendations and a roadmap for bringing together different interest groups (as described in the DoA in T 7.1) by the end of HiDALGO.

The methods used are described in D7.2 as well. In short, the task internal community building uses different means: dedicated session at meetings, observation of meetings, internal interviews and internal surveys. The emphasis lies on the surveys and the dedicated sessions.

4.1.2 Developments in year 2

This deliverable includes the analysis of the internal surveys of the plenary meeting in Graz in November 2019, the online technical meeting in April 2020 and the online plenary meeting in May 2020.

Results of the analysis of the plenary meeting in Graz in November 2019

The plenary meeting in Graz took place on 6-7 November. As the internal community building did not seem to be an issue at that moment (rather, the external community building was pressing at that moment), there was no separate session about internal community building. However, again a questionnaire was distributed (one before and one after the meeting).

It covered the main areas like overall state of the project, transparency, integration and the effectiveness of the meeting. At the end there was an open question to note down any comments.

The analysis shows the following picture: The perceived overall state of the project is satisfactory. The transparency in general is very high, and there is a very good basis regarding the efficiency of internal community building. The collaboration between the partners is perceived as quite effective – and even improved during the first year.

However, it was also identified the need to better integrate the business aspects with the technical work and to define a clear view on the offerings of HiDALGO. In response, WP2 set up bi-weekly phone conferences, inviting all WP2 partners and key partners from other WPs.

In parallel, WP6 set up regular phone conferences regarding the definition of the marketplace. This was influenced also by the WP5 work on the Portal.

The survey of the Graz meeting showed that the integration could be slightly improved, that the big picture was not entirely clear to all partners and that a common language still needed more development (*"All project partners use all the technical terms in the same understanding."* median = 5, max = 7, min = 2; 7 = completely agree, 1 = completely disagree). The outcomes were fed back to the consortium and especially to the ECM.

Results of the analysis of the virtual technical meeting in April 2020

The technical meeting had been planned for 1-3 April 2020 in Poznan. However, due to the Covid-19 pandemic, the meeting took place in an online format. The agenda foresaw long breaks between the sessions (at least half an hour, often more). A very short online survey was used for analysing the meeting, as the next plenary meeting was planned for May 2020 already and as the technical meeting focuses "only" on the technical parts of the project.

The analysis shows the following picture: The transparency of tasks is satisfactory, i.e. people are clear about their tasks and next steps.

The transparency of what HiDALGO will offer as services, on an overall level and within the 'marketplace' still needs to be improved. This was expected. We posed this question to have

start values to observe the development over time. To improve the situation, WP2 (and 6) had regular phone calls for several months (starting in February and going on until May 2020).

The meeting was perceived as efficient. The online format is considered as useful for the future.

Some items need to be considered especially for an online format: include a short technical check before the meeting, keep the long breaks between the sessions, anticipate well how much time each session needs and strong (time) moderation of the sessions. It seems to be more difficult to engage in real discussions compared to face to face meetings. In addition, the time between the sessions cannot be used for talks like in coffee breaks. On the other hand, it is time efficient that only those persons attend the sessions that are involved topic-wise.

Results of the analysis of the online plenary meeting in May 2020

The plenary meeting took place on 18-20 May as a series of online calls. Originally, it had been planned to have a session dedicated to internal community building, but when consulting with the project leader before the meeting, it was decided, that a clear focus on and sufficient time for the business aspects, the market place and the external community building would improve integration within the project (internal community building is not a separate topic per se, but it accompanies the concrete topics of the project).

Again, a questionnaire was distributed (one before and one after the meeting), in an online format. The number of respondents before the meeting was 16 and after the meeting 17, with 12 persons having answered both surveys. Therefore, the ratings of before and after the meeting cannot be directly compared.

The survey covered the main areas like overall state of the project, transparency, integration, effectiveness of the project and the effectiveness of the meeting. At the end there was an open question to note down any comments.

The analysis indicates that the perceived overall state of the project is satisfactory. In terms of group development there is a shift from M12 to M18 from the phase ‘norming’ to the phase ‘performing’. This shows that the project is on good tack.

The transparency in general is satisfactory. However, it is not entirely clear what the concrete services will be and what the marketplace will include. This is a focus of the current months of the project and is worked on intensely in all WPs.

The (strategy for) external community building seems not to be completely clear to all partners, nor is it rated as completely efficient. One reason might be that before we can effectively approach stakeholders, the offerings need to be clear and first results of the case

studies need to be available. Therefore, it is expected that the external community building will be more effective from M18 onwards. Regarding the clarity of the strategy, it was presented at the plenary meeting in M18. More regular WP7 telcos were introduced to increase the visibility of the work dedicated to external community building.

For the time being, the effectiveness of HiDALGO seems to be sufficient (e.g. first results are perceived to be meaningful, future results are expected to be meaningful, the aims are perceived as realistic and the vision is perceived as partly implemented). The development of a common language has improved as the min value has increased from 1 at the kick-off meeting, over 2 at the plenary meeting in M12 to 4 at the plenary meeting in M18 (*"All project partners use all the technical terms in the same understanding."*; 7 = completely agree, 1 = completely disagree). The mean / median values are still between 5 and 5.5 and the max value is still 7. This indicates that most partners agree on the same usage of most of the technical terms.

After the survey had been analysed, DIA had bi-lateral phone calls with the work package leaders to discuss the results (throughout July 2020). The results were also discussed in a TCC phone call at the beginning of July 2020. One suggestion took shape during these conversations, and was implemented afterwards, namely the internal newsletter (see below). The usefulness of (regular) internal webinars was strengthened. Overall, it seems that the single parts of the project are working well, but that at some points it would be more efficient to make the advancements even more visible to all other project partners. The internal wiki and the internal newsletter will foster this.

Overall developments during year 2

Overall, the project is on a good track from an internal community building point of view. It moved from a stage in which methods had to be tested, agreements to be taken and norms to be decided upon to a stage in which the work is effectively performed based on the previous experiences and decisions.

Most of the project members have an interdisciplinary background and therefore smoothly started work with colleagues from other disciplines and communities. The openness of the different communities was rated as high from the beginning onwards, as well as the transparency of the aims, vision and clarity of tasks, roles of partners and roles of disciplines.

From the beginning of the project a common understanding of the roles of the project partners and of the responsibilities could be observed. Respondents rated the collaboration among the partners as effective, and this rating even increased over time.

The mutual understanding within the own discipline(s) as well as regarding the other discipline(s) was rated as high from the beginning of the project already, and even increased over time. Regarding the question if all the project partners use all the technical terms in the same understanding, the ratings varied at the beginning (with the mean being relatively high already). Over time the minimum value increased from 1 to 4, so that the variance was reduced. This is interpreted as a sign that most partners agree on the same usage of most of the technical terms.

During the first year the main focus lay on the technical tasks, while the definition of the offerings, services and the marketplace took more concrete form from M 12 onwards and were available in September 2020. As soon as the infographic of the offerings was available and integrated to the webpage, potential stakeholders were approached.

4.1.3 Effective means for internal community building

The following suggestions were gathered during meetings, within surveys, during bilateral interviews of the T 7.2 leader with the WP leaders and other interested persons and they emerged from the daily project work. The chapter focuses on the developments in year 2.

To foster integration and exchange within the project, we have implemented five main means: regular WP-based or topic-based phone calls, internal webinars, dedicated sessions at plenary meetings, internal project wiki and an internal newsletter.

Regular phone calls on a WP / topic basis

HiDALGO established several integrating types of phone calls. Regular WP phone calls serve the exchange within the WPs, the WP2 phone conference series illuminates the offerings and stakeholder types, dedicated WP6 phone calls on the market place harmonise the views of project partners from different WPs (technical view, business view, stakeholder view) and the regular TCC / ECM phone call foster integration on a higher level from a management perspective.

In the survey in M 18 it was asked which processes have helped integration so far (providing the types of phone conferences described above as pre-defined answers)? Multiple answers were possible (N = 17). WP phone conferences were identified to be the most efficient calls while the other types were rated to be less efficient. In addition, the respondents could add other types of phone conferences which they perceived as efficient. Two answers were provided: working group phone calls (not WP), and the virtual technical and virtual plenary meetings.

Internal webinars and dedicated phone calls to specific integration topics

Internal web-seminars have been conducted about HiDALGO skills and tools. In case these are shared with or beneficial to other CoEs, attendance has been granted to their members as well. Please refer to Section 3.4.3, in summary they are:

- Introductory Webinar on OpenProject
- Best Practice Guide for Git and Jenkins
- Cloudify Blueprint Preparation, CKAN API Usage
- Tutorial FabSim3 and Muscle3
- Presentation of the HiDALGO Portal (upcoming)

In addition to the internal webinars, dedicated phone calls were organised to specific integrating topics, if appropriate, e.g. concerning the market-place, the business plan, the route to exascale and the preparation of dissemination events.

Sessions on internal community building and / or integration during the meetings

HiDALGO had explicit sessions on internal community building at the kick-off meeting and the plenary meeting in M 6 (see Deliverable 7.2). At the plenary meeting in M 12 no need was seen for a separate session. In M 18, originally, it had been planned to have a session dedicated to internal community building. However, when consulting with the project leader before the meeting, it was decided, that a clear focus on and sufficient time for the business aspects, the market place and the external community building would improve integration within the project (internal community building is not a separate topic per se, but it accompanies the concrete topics of the project).

A more general recommendation is that it is important to start with awareness creation on a meta-level at the beginning of the project, and in later stages to adapt to the project flow and support single or several integrating topics.

Internal project wiki

During the technical meeting in April 2020 (online) there showed the need to establish easy knowledge exchange and documenting the activities. Therefore, it was decided to set up an internal wiki. In this place, the project partners describe their work status and link to the respective documents on the OwnCloud (project ‘intranet’). Exchange is facilitated about what exactly people work on, what exactly is available already (e.g. code) and what the next steps

are. In this form, the wiki also fosters integration on several levels (e.g. integration of technical tasks, of knowledge, of aligning working steps).

It is especially interesting that this request emerged from the 'grassroots' shortly after the task internal community buildings had noted that the integration still could be improved.

Internal newsletter

In July 2020 DIA discussed with the work package leaders, how the information present in the project could be distributed amongst the consortium, as not everybody is a member of the TCC obviously. In addition to the wiki, the idea was developed to have a short monthly internal newsletter. The newsletter includes the topics business models, parallelization and route to exa-scale, use case development, Portal, AI support, HPDA and dissemination and events.

Definition of terms – common language

As decided in M5 (plenary meeting), DIA provided a list where definitions of terms can be added. Most WPs included their definitions by spring 2020. It was also suggested by one partner to have an online version. Therefore, such an online version was implemented as part of the homepage. People adding to the lexicon can decide if the definitions will be shown internally only or also externally (later on).

Specify in detail the business aspect, e.g. the offerings and services

In the survey of the plenary meeting in M12 as well as during the cluster review, the need was pointed out to define in more detail HiDALGO's offerings, stakeholders and services. Therefore, from February 2020 onwards, WP2 set up biweekly telcos. In addition, WP5 continued to work on the provision of services, inviting WP2 to participate and ending with a list of business goals to be accomplished by the project. WP6 set up several telcos to define the marketplace, inviting WP2 as well to discuss about the potential architecture. As a result of this, a set of specific requirements for the future marketplace where included in D6.5 [24]. HiDALGO's offerings were available in May 2020 and went online as an infographic in June 2020. The definition of stakeholder types was finalised in May 2020 as well.

4.1.4 Next steps

HiDALGO will follow up with the internal surveys at its meetings. Furthermore, one more detailed survey is planned in early 2021. A whitepaper on the findings with respect to bringing together different communities within an interdisciplinary project will be provided in month 36 as D7.6 'Final Report on HiDALGO Internal Community Integration'.

5 Conclusions

In this deliverable, HiDALGO's strategy for external community building has been presented. The website, Twitter and other social media accounts are updated on a continuous basis and material for contacting stakeholders (e.g. flyers) is available. Collaboration with other projects and initiatives is ongoing. New stakeholders are sought jointly with the other work packages. The training concept is available and updated.

The main challenges are the Covid-19 pandemic and the involvement of potential stakeholders. The acquisition of new customers is always challenging, especially in such a broad field as global challenges. It can be observed that there is no 'global challenges community' so far, but there exist many topic-related communities (e.g. on climate change, energy storage, sustainability…). Therefore, there is not one location, like a conference, where all potential stakeholders are present. In contrast, many sectorial events, HPC / HPDA related events and also simulation related events need to be taken into account.

Due to the Covid-19 pandemic many scientific conferences have been cancelled or converted to virtual events. On the one hand, in this fashion, a greater audience can be reached, on the other hand, many otherwise natural occasions for networking are lost. HiDALGO faces this challenge by offering videos, web-seminars and interactive online workshops at conferences.

Next steps include keeping up the collaboration with work package 2 on the business and stakeholder aspects, regularly updating the webpage and social media channels, organising training and dissemination events, presentations of the project work during conferences and other events and following up the work on internal community building.

An update of the work and final results will be included into the deliverables D7.5 'Final Report on Community Building, Event Management, Collaboration and Training' and D7.6 'Final Report on HiDALGO Internal Community Integration'.

References

[1] HiDALGO D2.1 – Stakeholder Context and Initial Exploitation Assets

[2] HiDALGO D2.2 – Intermediate Report on Exploitation and Sustainability Strategy

[3] HiDALGO D7.2 – Annual Report on Community Building, Event Management, and Collaboration

[4] HiDALGO CoE website "Events Calendar", [Online] https://hidalgo-project.eu/events [Accessed 2020-10-17].

[5] HiDALGO D7.3 – Training Concept. Zanon, Lorenzo 2020.

[6] HiPEAC 2021 (Budapest, Hungary / online, 18-20 January 2021), [Online] https://www.hipeac.net/2021/spring-virtual/#/ [Accessed 2020-10-17].

[7] Koller, Bastian (2020). EuroCC and CASTIEL presentation, [Online] https://events.prace-ri.eu/event/1050/attachments/1305/2312/Overview%20of%20EuroCC_PRACE_Bastian_Koller_HLRS_10_09_20.pdf [Accessed 2020-10-17].

[8] Moodle, [Online] https://moodle.hidalgo-project.eu/ [Accessed 2020-10-17].

[9] GoToWebinar, [Online] https://www.gotomeeting.com/webinar [Accessed 2020-10-17].

[10] HiDALGO CoE YouTube Channel, [Online] https://www.youtube.com/channel/UCajIi2XMTsQRDMKcvgvoaAg [Accessed 2020-10-17].

[11] HiDALGO CoE website, [Online] https://hidalgo-project.eu [Accessed 2020-10-17].

[12] HiDALGO D5.6 – Second HiDALGO Portal Release and System Operation Report. Nieto, F. Javier 2020.

[13] International Organization for Migration, [Online] https://www.iom.int [Accessed 2020-10-17].

[14] HiPEAC 2020 (Bologna, Italy, 20-22 January 2020), [Online] https://www.hipeac.net/2020/bologna/#/ [Accessed 2020-10-17].

[15]Cloudify usage documentation, [Online] https://croupier.readthedocs.io [Accessed 2020-10-17].

[16]Fielding, Roy Thomas (2000). "Chapter 5: Representational State Transfer (REST)". Architectural Styles and the Design of Network-based Software Architectures (Ph.D. thesis). University of California, Irvine.

[17]HiDALGO D4.2 – Implementation Report of the Pilot Applications. Horváth, Zoltán 2019.

[18]Copernicus CDS API, [Online] https://cds.climate.copernicus.eu/api-how-to/ [Accessed 2020-10-17].

[19]Tutorials at ISC 2021 (online, June 27 – July 1 2021), [Online] https://www.isc-hpc.com/tutorials-2021.html [Accessed 2020-10-17].

[20]MPI for Python, [Online] https://mpi4py.readthedocs.io/en/stable/ [Accessed 2020-10-17].

[21]Dask.distributed, [Online] https://distributed.dask.org/en/latest/ [Accessed 2020-10-17].

[22] Gauss Centre for Supercomputing, [Online] https://www.gauss-centre.eu/ [Accessed 2020-10-17].

[23] Nicolson, C. R., Starfield, A. M., Kofinas, G. P., Kruse, J. A. (2002), Ten heuristics for interdisciplinary modeling projects, *Ecosystems*, 5(4), 376-384

[24] HiDALGO D6.5 – Intermediate Report on Requirements, Components and Workflow Integration

Annex I – Letter for contacting stakeholders

Do you need support in expertise or computer power to tackle your global challenge?
Do you want to extend your professional network?

YOU are a private company, from policy, an NGO, a societal player or a research unit and you have a complex task to solve? – We help you to master your challenge!

We offer a wide variety of services:

- EASY ACCESS TO POWERFUL COMPUTE RESOURCES so that you can elaborate your own complex simulations and run them on supercomputers.
- CONSULTING and the provision of tailored solutions based on a great network of highly experienced professionals. Working in an interdisciplinary team on high performance computing, data analysis and artificial intelligence as well as on different topics related to global challenges, our experts will effectively develop individual solutions.
- TRAINING and professional networking (e.g. we provide interactive forms of learning and exchange, and the possibility of associate partnership).

For more information

- Visit our website https://hidalgo-project.eu/
- Stay up to date on Twitter @EU_HiDALGO
- Contact us directly at contact@hidalgo-project.eu

Our mission

We develop novel methods, algorithms and software for high-performance computing (HPC), high-performance data analysis (HPDA) and artificial intelligence (AI) to accurately model and simulate the complex processes, which arise in connection with major global challenges.

Our case studies

In our three example case studies we work on different global challenges. These models can be used as a basis for tailored solutions. In addition, we offer to solve other global challenges.

Urban Air Pollution | Forced Migration | Spread of Messages in Social Networks.

Check out what we can do for you!

Annex II – Stakeholder survey

HiDALGO – HPC and Big Data Technologies for Global Systems

Do you need support in expertise or compute power to tackle your global challenge?

Whether you are from industry, research, policy or an NGO, we help you to master your global challenge!

HiDALGO offers a wide variety of services: from professional networking, over support and training to the usage of high-performance computing (HPC) resources specialised in data-centric computation.

Please help us to improve our services by answering the following questions. Thank you very much for your time!

The information you provide within this survey will only be used within the HiDALGO consortium to evaluate and improve its services. It will not be shared with any third parties.

Characterising your company / institution

1. I work for a
   - ☐ Company
     - ☐ SME
     - ☐ Large enterprise
   - ☐ University or research institute
   - ☐ NGO
   - ☐ Other: Please specify

     _____

2. In which country is your principal European office / your institute located?

   _____

3. Which industrial sector is your company allocated to? What do you sell / produce / offer as service?

   _____

4. Which is your position within your organization?

   _____

Current computations within your company

5. What kind of infrastructure do you use for your computations?
   - ☐ Desktops and workstations
   - ☐ In-house High-Performance Computing Cluster (HPC)
   - ☐ Remote HPC Cluster
   - ☐ Public Cloud (e.g. Amazon AWS)
   - ☐ Private Cloud
   - ☐ Other (please specify):

     _____

6. In case you do not use High-Performance Computing (HPC): Why?
   - ☐ Our computations are not large enough
   - ☐ HPC is too expensive
   - ☐ HPC is too complex
   - ☐ We have not found the right provider yet

Other (please specify):

_____

Challenges and needs

7. What are the most common challenges you face regarding your modelling / simulation / analytics?

   _____

   _____

   _____

8. Which services offered by HiDALGO would you use?
   - ☐ Running your HPC / HPDA codes on HiDALGO's HPC resources
   - ☐ Support for running your codes on HiDALGO's HPC resources
   - ☐ HPC as a service
   - ☐ Code enhancement / adaptation requests
   - ☐ Consultancy / tailored solutions
   - ☐ Taking part in our training
   - ☐ Taking part in our workshops
   - ☐ Networking options like forum, match-making service
   - ☐ Adapting our case studies to your data, and running the simulation on HiDALGO's HPC resources
     - ☐ Migration
     - ☐ Urban Air Pollution
     - ☐ Spread of Messages in Social Networks
   - ☐ Other (please specify): _____

9. Would your organisation pay for using these services?
   - ☐ Yes
   - ☐ No
   - ☐ Maybe

   If you answered "No": Could you please give a reason?

   _____

   If you answered "Maybe": Under which conditions would your organisation be willing to pay for using these services?

   _____

10. HiDALGO can offer training in various domains. Which specific topics would be most interesting for you?
    - ☐ Introduction to HPC: A beginners' guide.
    - ☐ Introduction to Global System Sciences and its challenges
    - ☐ High-performance computing (HPC) vs. Cloud. When to use what?
    - ☐ Developing for HPC, using parallelization techniques
    - ☐ Code optimisation for HPC
    - ☐ Applying artificial intelligence to get new insights from my data
    - ☐ Introduction to specific application areas:
      - ☐ Migration
      - ☐ Urban Air Pollution
      - ☐ Spread of Messages in Social Networks

☐ Other (please specify):

_____

11. Which areas of research to simulate global challenges / complex systems (if any) do you currently work in?

_____

_____

12. Which areas of research to simulate global challenges and complex systems do you expect to grow in importance over the next years?

_____

_____

13. To what extent do you expect these areas (indicated in 12) to require large-scale computing capacity?

Not required at all		Mix of standard and high-performance solutions				Large scale data and analytics on HPC/Cloud will dominate the market
1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

14. To what extent do you expect these areas (indicated in 12) to require large-scale data analytics capacity?

Not required at all		Mix of standard and high-performance solutions				Large scale data and analytics on HPC/Cloud will dominate the market
1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐

Thank you very much for your time! We very much appreciate your collaboration!

HiDALGO advances HPC, HPDA and AI technologies in order to improve data-centric computation in the domain of Global Challenges. It is an EU-funded 3-year project involving an interdisciplinary team of 13 partners from seven countries (Dec 2018 – Nov 2021). Website: https://hidalgo-project.eu Twitter: @EU_HiDALGO

Annex III – List of potential stakeholders

Global Challenges	Type of potential Users	Examples for concrete potential users
Climate change: Warming of the sea	Oceanographic institutes	Alfred-Wegner Institut (AWI), Germany
	Country impacted by El Niño	California, Peru, Bolivia, Ecuador, Paraguay, Brasilia, parts of Latin America, Southeast Africa, Southeast Asia, Indonesia, Australia
Climate change: Melting of the ice shields and rising of sea level	Oceanographic institutes	E.g. the AWI uses several models, e.g. an atmospheric model coupled to an ocean model, running on an HPC system at the Deutsches Klimarechenzentrum (DKRZ)
	Country impacted by sea level rise	St. Kitts and Nevis in the Caribbean, Ecuador, Vietnam, Bulgaria, Seychelles, Cuba, Sweden, Iraq, Azerbaijan, El Salvador, Japan, China, Bangladesh, India, Indonesia, Thailand
	Economic players in countries impacted by sea level rise, e.g. tourism, industry	Farming and tourism
	Economic players in countries impacted by melting of ice, e.g. tourism (hotels etc.), industry	Greenland, Iceland, Canada, Alaska, Argentina
Climate change: Water scarcity / aridity	Researchers of impacted countries or working on the topic	https://ec.europa.eu/jrc/en/publication/impact-changing-climate-land-use-and-water-usage-europes-water-resources-model-simulation-study
	Governments of impacted countries	In 2040: Spain, Portugal, Italy, Greece, Albania, Turkey, Arabic Peninsula, Kazakhstan, Iran, Afghanistan, China, India (a lot more), North and South Africa, USA, Mexico, Peru, Chile, Australia

Global Challenges	Type of potential Users	Examples for concrete potential users
	Farmers of impacted countries	Municipalities and associations
	General public living in the impacted countries -> climate refugees	Oxfam, Save the children
	Tourism (hotels etc.)	Meliá Hotels International Barceló Hotels & Resorts
Climate change: Extreme weather events like flooding, storms etc.	Governments of impacted countries	Many countries suffer from inundations, storms, storm tides… https://www.germanwatch.org/sites/germanwatch.org/files/20-2-01%20KRI%202020%20-%20Kurzzusammenfassung_8.pdf
	Researchers of impacted countries or working on the topic	Climate modellers (e.g. PIK, AWI) and weather modellers (e.g. ECMWF and the local meteorological institutes)
	Industry of impacted countries	- Operator of Nuclear power stations (near to the sea) - Insurance companies - Beverage industry - Skiing -Wineries - Agriculture companies - Commercial fishing
	NGOs and aid agencies	UNHCR, Save the Children, Oxfam…
Climate change: Change of species composition etc.	Agricultural sector and ecological institutes	Ecological institutes
Climate change: Moving of diseases transmitted by animals e.g. mosquitoes to other regions	Policy makers of impacted countries	Spain, Portugal, Italy, Greece,... South America and USA
	Researchers and institutes	Robert-Koch-Institut

Global Challenges	Type of potential Users	Examples for concrete potential users
Climate change: Deforestation and paper	Researchers	Impacts of forestation and deforestation on local temperature across the globe - 2019: - Jayme A. Prevedello - Gisele R. Winck - Marcelo M. Weber
	Governments of impacted countries	Many countries in the Amazon rainforest like Brazil, Bolivia, Colombia, Ecuador, Guyana, Suriname and Peru (see Leticia-pact); Russia, Indonesia, Australia
Climate change: Eat less meat	Governments	In the Netherlands, the state gives money to pig farmers who stop breeding pigs and give the land back to nature. They build care homes for the elderly instead. Initiatives for animal wellbeing
	Researchers	Reducing meat consumption in developed and transition countries to counter climate change and biodiversity loss: a review of influence factors - 2017: - Susanne Stoll-Kleemann
Climate change: Plagues indirectly caused by climate change	Governments of impacted countries	E.g. grasshopper plague in Africa
	NGOs	i.e. Oxfam
Climate change: Thermohaline Circulation	Researchers	Intensification and poleward shift of subtropical western boundary currents in a warming climate - 2016: Gerrit Lohmann, Monica Ionita
Sustainable development, resources: Waste, plastic in the sea, plastic from renewable resources,…	Researchers / policy makers modelling the waste cycle / debris in the oceans	www.umweltbundesamt.at Study Courses with the Topic Environmental monitoring (TU Graz) https://www.pnas.org/content/111/28/10239.short -> modelling debris in the oceans

Global Challenges	Type of potential Users	Examples for concrete potential users
	Researchers / economic players investigating in producing plastic from renewable resources	Fraunhofer Institut Bundesverband Meeresmüll e.V. Greenpeace e.V.
	Economic players	Food manufacturers
Sustainable development, resources: Clothes	Economic players	Manufacturer of clothing: https://www.trigema.de https://maas-natur.de/ https://www.hessnatur.com Raw material suppliers
	Institutions	OEKO-TEX Certification-Organisations Re-Use (Shops / Community-Platforms)
	Fair trade organisations and initiatives – standardisation bodies	Local and global certification organisations and initiatives
	Producer countries	India, Bangladesh, Black Africa, South America, etc.
	NGOs	At global, national and local levels
Sustainable development, resources: The future of food and its origin	Economic players	Food Supplier Regional Offer of food Local farmers selling organic food incl. delivery service (“Biokiste”)
	General public	App or initiatives to save food https://toogoodtogo.ch/de-ch Local initiatives acting without profit
	Research	Platforms for food https://ethz.ch/content/dam/ethz/special-interest/baug/ifu/ifu-dam/documents/projects/china-gwm/journal-papers/ifu-cwmp-McLaughlin+Kinzelbach-

Global Challenges	Type of potential Users	Examples for concrete potential users
		Food_security_and_sustainable_resource_management-2015.pdf
Sustainable development, resources: Consumer products	Economic players	https://sustainablebrands.com/browse/subjects/consumer-products https://www.greenbiz.com https://shop.fairphone.com/de
	Research	https://doi.org/10.1002/sd.394
	Initiatives and general public	https://www.nachhaltigkeitsrat.de/en/the-council/ https://repair.eu/
Sustainable development, resources: Energy (secure, clean and efficient)	Economic players	https://www.greenpeace-energy.de/ https://buergerwerke.de/
	Research	See also EoCoE https://www.eocoe.eu https://www.kopernikus-projekte.de/projekte https://eurec.be/
	Institutions / communication etc.	https://www.cleanenergy-project.de/
	Policy Makers	Agenda 2030, EC Green Deal, etc.
Sustainable development, resources: Energy storage	Economic players	Energy Groups (e.g. www.e-steiermark.com) Automotive companies (e.g. www.avl.at)
	Research	https://www.fraunhofer.de/de/forschung/forschungsfelder/energie-rohstoffe/energie-speichern-und-managen.html https://speicher.aeesuisse.ch/de/

Global Challenges	Type of potential Users	Examples for concrete potential users
Sustainable development, resources: Clean water	Researchers / policy makers modelling the water cycle	Division 14 Water Management, Resources and Sustainability https://www.verwaltung.steiermark.at/cms/ziel/74836586/DE
	Institutions / international organisations	https://unicef.at/einsatzbereiche/wasser-hygiene/ (Africa, Latin America and Asia)
	Economic Player (Sensor development) Wastewater treatment plants	https://www.wasserwirtschaft.steiermark.at/
Sustainable development, resources: Population and resources	Governments	All countries
	Economic players	Consulting companies in relation to supply chains
	Research	https://www.zef.de/fileadmin/downloads/forum/docprog/Termpapers/2004_3b_Mensah_Castro.pdf https://www.mdpi.com/journal/sustainability/sections/environment_and_resources https://www.infactproject.eu/
	International organisations / institutions / initiatives	https://ec.europa.eu/environment/archives/natres/index.htm https://www.unece.org/high-impact-areas/general-introduction/sustainable-use-of-natural-resources.html https://www.dsw.org/
Sustainable development, resources: Resources for IT devices	Governments	
	Research	https://journals.sagepub.com/doi/pdf/10.1177/0734242X13499814 https://link.springer.com/content/pdf/10.1007/s13243-018-0042-1.pdf https://pubs.rsc.org/en/content/articlepdf/2014/cs/c3cs60235d

Global Challenges	Type of potential Users	Examples for concrete potential users
	Economic players	https://shop.fairphone.com/ http://www.puzzlephone.com/
	International organisations / institutions / initiative	https://en.reset.org/ https://www.germanwatch.org/de/thema/unternehmensverantwortung/faire-nachhaltige-it
Sustainable development, resources: Transport (smart, green and integrated)	Research	https://ec.europa.eu/transport/themes/sustainable_en https://www.tandfonline.com/doi/abs/10.1080/13504509.2015.1051497
	Economic players	Train companies https://sonomotors.com/de/ https://www.share-now.com/de/de/
	Municipal / local public transport provider – Policy makers	Municipal / local public transport provider – Policy makers
Sustainable development, resources: Ecological Collapse	Governments / international organisations	https://ipbes.net/ https://www.iucn.org/ https://www.wri.org/
	International initiatives	http://www.foeeurope.org/World-faces-ecological-collapse-unless-urgent-action-taken-060519
	Research	Universities Ecological institutes
Sustainable development, resources: Sustainable (smart and green) cities and communities / Urban development, e.g. land consumption	Municipalities	Planning departments Waste departments Traffic departments
	Economic players	Energy providers Building companies Singapore is a role model for sustainable cities (countries). Consulting companies Architects and their companies

Global Challenges	Type of potential Users	Examples for concrete potential users
		Providers of green logistic solutions
	Research	https://www.ihs.nl/en https://www.wur.nl/en/Research-Results/Research-Institutes/Environmental-Research/Programmes/Green-Cities.htm
Societies: • Democratization • Global foresight and decision making • Global convergence of IT • Rich – poor gap • Education and Learning • Peace and conflict • Status of women • Inclusive, innovative and reflective societies • Secure societies, protected freedom • Weapons of mass destruction • Transnational organised crime • Global Ethics • Strong institutions • No trade with basic goods like drinking water • Dealing with population trends • Partnerships	Governments	https://www.osce.org/democratization https://ec.europa.eu/info/sites/info/files/research_and_innovation/groups/rise/cuhls-foresight_into_decisions.pdf https://www.gao.gov/assets/710/700836.pdf
	Initiatives and (international) organisations	https://www.un.org/en/sections/issues-depth/democracy/index.html https://www.oecd.org/strategic-foresight/ourwork/Strategic%20Foresight%20for%20Better%20Policies.pdf http://www.millennium-project.org/challenge-6/ https://www.unece.org/info/media/news/statistics/2017/measuring-the-gap-between-rich-and-poor/doc.html https://www.oxfam.org/en/5-shocking-facts-about-extreme-global-inequality-and-how-even-it https://www.wto.org/english/res_e/reser_e/ersd201005_e.pdf https://www.knightfoundation.org/features/misinfo
	Research	https://www.die-gdi.de/briefing-paper/article/democracy-support-

Global Challenges	Type of potential Users	Examples for concrete potential users
• Social networks and disinformation		and-peaceful-democratisation-after-civil-war/ https://www.globalforesightsummit.com/ https://link.springer.com/chapter/10.1007%2F978-3-319-15027-7_4 https://www.ut.ee/en/tiit-tammaru http://www.maartenvanham.nl/ https://inequality.org/about/ https://www.odycceus.eu/ https://penelope.vub.be/bringing-tools-for-media-monitoring-to-the-public-outcomes-of-the-odycceus-summer-school-on-democracy-in-the-age-of-big-data-and-ai-fetfx-future-tech-week-contribution/ https://people.mpi-sws.org/~manuelgr/ https://dorian-projekt.sit.fraunhofer.de/
	Economic players	http://www.vcombinator.network/index.php/challenges/policy-challenges/global-foresight-and-decisionmaking http://theglobalforesightgroup.com/home Google, Apple, Amazon, Nestlé, Twitter, Facebook…
Societies and technology: • Science and Technology • Artificial Intelligence • Solar geoengineering	Governments	Governments
	Initiatives and (international) organisations	https://ec.europa.eu/jrc/communities/sites/jrccties/files/eedfee77-en.pdf (OECD)
	Research	Joanna Bryson, University of Bath https://www.bbvaopenmind.com/en/articles/the-past-decade-and-future-of-ais-impact-on-society/

Global Challenges	Type of potential Users	Examples for concrete potential users
		https://www.srf.ch/kultur/wissen/solar-geoengineering-gegen-globale-erwaermung-ein-sonnenschirm-fuer-die-erde https://geoengineering.environment.harvard.edu/geoengineering https://doi.org/10.1073/pnas.1916637117
	Economic players	https://www.icaew.com/insights/features/2020/mar-2020/the-true-impact-of-artificial-intelligence-on-society https://www.shapingtomorrow.com/home/alert/275454-The-Future-of-Intelligence---impacts-on-society
Natural disasters: • Asteroid impact • Supervolcanic eruption • Huge forest fires • Earthquakes	Governments of impacted countries	https://ec.europa.eu/commission/presscorner/detail/en/IP_19_6176 Portugal, Spain, Greece, Russia, Brazil, France...
	Research	See also ChEESE CoE https://www.nature.com/articles/d41586-019-01604-w DOI 10.1098/rstb.2015.0345 https://www.mdpi.com/journal/remotesensing/special_issues/foresetfire_bigdata
	(International) organisations	https://mobil.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/WWF-Study-Forests-Ablaze.pdf https://www.c2es.org/content/wildfires-and-climate-change/
Health issues and wellbeing: Pandemics	Governments	Cross-Border Healthcare https://ec.europa.eu/health/cross_border_care/toolbox_en

Global Challenges	Type of potential Users	Examples for concrete potential users
	Research	Robert-Koch-Institut, Germany https://science.sciencemag.org/content/367/6485/1414.2 Imperial College London https://www.imperial.ac.uk/mrc-global-infectious-disease-analysis/covid-19/covid-19-reports/ https://www.exscalate4cov.eu/
	Initiatives and (international) organisations	http://www.millennium-project.org/covid-19/
	Economic players	E.g. companies which produce vaccines, robots, masks, gloves, any medical equipment, clean water...
	General public	General public
Health issues and wellbeing: Clean and sufficient food for everybody	Governments	https://www.bfs.admin.ch/bfs/en/home/statistics/sustainable-development/monet-2030/all-indicators/6-eau.html
	Research	http://www.millennium-project.org/challenge-2/ https://www.alumniportal-deutschland.org/en/global-goals/sdg-02-hunger/nutrition-food-agriculture/ ???
	Initiatives and (international) organisations	https://www.un.org/waterforlifedecade/food_security.shtml https://www.weforum.org/agenda/2015/12/how-can-we-ensure-clean-water-for-everyone/ https://www.un.org/sustainabledevelopment/water-and-sanitation/ http://www.fao.org/3/w3613e/w3613e00.htm
	Economic players	Global food chains Fruit & Vegetable suppliers

Global Challenges	Type of potential Users	Examples for concrete potential users
		Farmers
	General public	General public
Health issues and wellbeing: Diseases of affluence	Governments	https://www.bundesgesundheitsministerium.de/fileadmin/Dateien/5_Publikationen/Praevention/Broschueren/Broschuere_InForm-Tut_uns_gut.pdf
	Research	https://www.diabetes.org.uk/research
	Initiatives and (international) organisations	https://www.who.int/chp/chronic_disease_report/media/Factsheet4.pdf?ua=1
	Economic players	Pharmaceutical industry
	General public	General public
Health issues and wellbeing: Smoking	Governments	https://www.bundesgesundheitsministerium.de/fileadmin/Dateien/3_Downloads/G/Gesundheitsziele/Broschuere_Nationales_Gesundheitsziel_-_Tabakkonsum_reduzieren.pdf
	Research	https://www.krebsdaten.de/Krebs/DE/Content/Krebsarten/Lungenkrebs/lungenkrebs_node.html
	Initiatives and (international) organisations	https://www.krebsgesellschaft.de/onko-internetportal/basis-informationen-krebs/bewusst-leben/rauchen-zahlen-und-fakten.html
	Economic players	Cigarette producers
	General public	General public
Economy: • Liabilities / debts	Governments	https://www.tagesschau.de/ausland/klimawandel-schulden-101.html China and USA (trade war)

Global Challenges	Type of potential Users	Examples for concrete potential users
• 'Export' of financial crisis of one or a few countries around the globe • Trade war • Tax haven		Tax havens in Europe and countries not working with companies allocated in them
	Economic players	Big IT providers: Amazon, Facebook, etc. European goods providers: i.e. Inditex
	Initiatives and (international) organisations	Oxfam

Annex IV – Dissemination and events

The following tables are listed in this Annex:

Journal articles and theses

Table [21]: Journal articles

Title of the journal article	DOI	Authors	Title of the journal	Number, volume, issue	Pages	Date
Applying machine learning methods to better understand, model and estimate mass concentrations of traffic-related pollutants at a typical street canyon	https://doi.org/10.1016/j.envpol.2020.114587	Iva Šimića, Mario Lovrić, Ranka Godeca, Mark Kröll, Ivan Bešlića	Environmental Pollution	Volume 263, Part B, August 2020, 114587	114587-114596	04/18/2020
FACS: A geospatial agent-based simulator for analyzing COVID-19 spread and public health measures on local regions	Preprint status	Mahmood, I, Arabnejad, H, Suleimenova, D, Sassoon, I, Marshan, A, Serrano, A, Louvieris, P, Anagnostou, A, Taylor, S, Bell, D, Groen, D	Journal of Simulation	Not yet available	Not yet available	Not yet available
How Policy Decisions Affect Refugee Journeys in South Sudan: A Study Using Automated Ensemble Simulations	10.18564/jasss.4193	Diana Suleimenova and Derek Groen	Journal of Artificial Societies & Social Simulation	23 (1)	-	01/31/2020

Table [22]: Theses

Title of the thesis/dissertation	Type of thesis	Authors	Place of publication	Date of publication
Predicting Forced Displacement Using a Generalised and Automated Agent-Based Simulation	PhD	Diana Suleimenova	Brunel University London, Kingston Lane, Uxbridge, UK	04/27/2020
Synthesizing Infomap – A Kullback-Leibler Divergence-Based Approach To Community Detection	Master	Christian Toth	Graz, Austria	05/26/2020
Graph Analyzer Tool	Bachelor	Florian Lugstein	Salzburg, Austria	TBD

Participation in conferences and workshops etc.

Table [23]: Conferences / workshops with proceedings

Title of conference or workshop	Place of conference / workshop / publication	Date of presentation	Title of publication	Authors
Winter Simulation Conference 2019	National Harbor, Maryland, USA	10 Dec 2019	Towards Modelling the Effect of Evolving Violence on Forced Migration	Derek Groen, David Bell, Hamid Arabnejad, Diana Suleimenova, Simon J. E. Taylor, Anastasia Anagnostou
Computational Science – ICCS 2019	Faro, Portugal	12 June 2019	A Coupled Food Security and Refugee Movement Model for the South Sudan Conflict	Christian V. Campos, Diana Suleimenova, Derek Groen
Winter Simulation Conference 2019	National Harbor, Maryland, USA	10 Dec 2019	Hybrid Simulation Development – Is It Just Analytics?	David Bell and Derek Groen, Navonil Mustafee, Jonathan Ozik, and Steffen Strassburger
Tag der Politikwissenschaft 2020	Vienna, Austria (held remotely)	27 Nov 2020	Message spread on Social Media. Comparing the FPÖ and NEOS during the election campaign of the 2019 Austrian National Council Elections	Jan Velimsky, Christoph Schweimer, Han Tran, Christine Gfrerer
ICCS 2020	Held remotely (planned in Amsterdam)	12 June 2020	Towards Accurate Simulation of Global Challenges on Data Centers Infrastructures via Coupling of Models and Data Sources	Sergiy Gogolenko, Derek Groen, Diana Suleimenova, Imran Mahmood, Marcin Lawenda, F. Javier Nieto de Santos, John Hanley, Milana Vučković, Mark Kröll, Bernhard Geiger, Robert Elsässer, Dennis Hoppe

Table [24]: Participation in conferences / workshops / training / other events

Title of conference / workshop / training / other event	Type	Title of presentation / poster / other	Authors	Place	Date
Computing Systems Week (CSW)	Poster at conference	AI-Support for large-scale refugee movement simulations	Martin Maritsch, Diana Suleimenova, Bernhard C. Geiger, Derek Groen	Edinburgh, United Kingdom	16-18 April 2019
4th Workshop on Model Reduction of Complex Dynamical Systems (MODRED 2019)	Poster at conference	Model Reduction in HiDALGO – Initial Plans and Ideas	Christoph Schweimer, Bernhard C. Geiger, Diana Suleimenova, Derek Groen, Christine Gfrerer, David Pape, Robert Elsässer, Tihamer Albert Kocsis, Bence Liszkai, Zoltán Horváth	Graz, Austria	28-30 Aug 2019
Computing Systems Week (CSW)	Presentation at conference	Mining Call Detail Records to understand Cross-border Refugee Movements	Martin Maritsch, Kevin Winter	Edinburgh, United Kingdom	16-18 April 2019
Networkshop 2019	Presentation at workshop	HPC és HPDA alkalmazások futtatását segítő infrastruktúrák	Zoltán Horváth, Tamás Budai, Ákos Kovács, Csaba Tóth, Bence Liszkai	Győr, Hungary	23-26 April 2019
HPC 2019 Bulgaria	Presentation at conference	European projects for HPC: MSO4SC and HiDALGO	Zoltán Horváth, Tamás Budai, Ákos Kovács, Bence Liszkai	Borovets, Bulgaria	2-6 Nov 2019
HPC 2019 Bulgaria	Presentation at conference	The Digital Twin of Urban Air Pollution	Bence Liszkai, Zoltán Horváth, Tamás Budai, Ákos Kovács,	Borovets, Bulgaria	2-6 Nov 2019
Urban Systems Global Challenges Digital Tools, International Symposium	Presentation at conference	Urban Air Quality Modelling and Management: Case Study of Győr	B. Liszkai, Á. Kovács, T. Budai, Cs. Tóth (SZE) and M. Leoni (BCAM)"	Stuttgart, Germany	28-29 May 2019
European HPC Training Stakeholder Workshop	Participation in activities organised jointly with other H2020 project(s):	Overview of HiDALGO training activity	Lorenzo Zanon	Brussels, Belgium	8 Oct 2019

Title of conference / workshop / training / other event	Type	Title of presentation / poster / other	Authors	Place	Date
	European HPC Training Stakeholder Workshop				
CAMS 4th General Assembly and User Day	Presentation at an event other than a conference or workshop	HiDALGO urban air pollution pilot based on CAMS data	Zoltán Horváth, Bence Liszkai, Ákos Kovács, Tamás Budai and Csaba Tóth	Budapest, Hungary	16-20 Sept 2019
GEHC First Global Data Science Symposium	Presentation at conference	Mathematical Technologies in Healthcare	Zoltán Horváth T. Budai, A. Horváth, T.A. Kocsis, A. Kovács, B. Liszkai, G. Takács, Cs. Tóth, (SZE Győr, Hungary), N. Kránitz, I. Rácz (Petz Aladár Teaching and County Hospital, Győr, Hungary)	Waukesha, Wisconsin, USA	23-24 Sep 2019
Sustained Simulation Performance Workshop	Presentation at workshop	Scaling of UAP Simulation on HPC architecture	L. Környei, Z. Horváth (Head), B. Liszkai, Á. Kovács, T. Budai, Cs. Tóth	Stuttgart, Germany	9-10 Oct 2019
EU Conference on Modelling for Policy Support	Poster at conference	Easy-to-use modelling tool for urban air pollution with very high resolution HPC simulations	Horváth Z., Liszkai B., Kovács A., Budai T., Tóth C.	Brussels, Belgium	26-27 Nov 2019
VECMA All-Hands meeting, Amsterdam	Presentation at conference	Delivering ECMWF Data and Services via the Cloud within HiDALGO	John Hanley, Milana Vuckovic, Stephan Siemen, James Hawkes, Tiago Quintinoand Florian Pappenberger	Amsterdam, Netherlands	9-10 May 2019
HiPEAC 2020	Workshop at conference	HPC and Big Data Technologies for Global Systems - Interactive Workshop and Hands-on Session	Zoltán Horváth, László Környei, Ákos Kovács, Hamid Arabnejad, Robert Elsässer, Marcin Lawenda	Bologna, Italy	20-22 Jan 2020
FOSS4G 2019	Presentation at conference	Building cloud environments with open source software to	Sylvie Lamy-Thépaut, Milana Vuckovic, Stephan Siemen	Bucharest, Romania	28-30 Aug 2019

Title of conference / workshop / training / other event	Type	Title of presentation / poster / other	Authors	Place	Date
		offer processing of large environmental data sets			
The EMS Annual Meeting: European Conference for Applied Meteorology and Climatology 2019	Poster at conference	Delivering ECMWF Data and Services via the Cloud within HiDALGO	Milana Vuckovic, John Hanley, Stephan Siemen, James Hawkes, Tiago Quintino, Florian Pappenberger	Lyngby Campus near Copenhagen, Denmark,	8-13 Sep 2019
IOM-FFO Workshop - "Forecasting Human Mobility in Contexts of Crises"	Presentation at workshop	Agent-based simulation for forecasting forced migration	Derek Groen, Diana Suleimenova	Berlin, Germany	22-24 Oct 2020
Digital4Med conference	Presentation at workshop	HPC and Big Data Technology for Global Systems	Derek Groen	Brussels, Belgium	8 April 2019
Mapping the Digital Humanities	Presentation at workshop	Modelling forced migration	Derek Groen	London, UK	15 Feb 2019
ICCS	Presentation and poster at conference	A Coupled Food Security and Refugee Movement Model for the South Sudan Conflict	Derek Groen, Diana Suleimenova	Faro, Portugal	12-14 June 2019
WSC	Presentation at conference	Towards Modelling the Effect of Evolving Violence on Forced Migration	Derek Groen, David Bell, Hamid Arabnejad, Diana Suleimenova, Simon J. E. Taylor, Anastasia Anagnostou	National Harbor, Maryland, USA	8-11 Dec 2019
Understanding the Transnational Everyday an RVI Research Project Focussed on South Sudanese and Somali Populations	Presentation at an event other than a conference or workshop	Agent-based simulation for forecasting forced migration	Diana Suleimenova	Addis Ababa, Ethiopia	5-8 Nov 2019
WSC	Panel discussion at conference	Hybrid Simulation Development – Is It Just Analytics?	David Bell	National Harbor, Maryland, USA	8-11 Dec 2019

Title of conference / workshop / training / other event	Type	Title of presentation / poster / other	Authors	Place	Date
AI - KNOW - World AI Congress for AI Enthusiasts	Poster at conference	HPC and Big Data Technologies for Global Systems	Mark Kroell	Graz, Austria	11 Feb 2019
100th AMS Annual Meeting - Session 3B International Hazards - What's the risk?	Presentation at conference	Building Cloud-Based Data Services to Enable Earth-Science Workflows across HPC Centres for Decision Makers	T. Quintino, Stephan Siemen, J. Hawkes, J. Hanley and M. Vuckovic	Boston, USA	12-16 Jan 2020
AGU Fall Meeting 2019	Poster at conference	HiDALGO - Developing Cloud-based Data Services to enable Earth-Science Workflows across HPC Centres	Stephan Siemen, Milana Vuckovic, John Hanley, James Hawkes, Tiago Quintino	San Francisco, USA	9-13 Dec 2019
FOSDEM 2020, HPC, Big Data, and Data Science devroom	Presentation at conference	Building cloud-based data services to enable earth-science workflows across HPC centres	John Hanley, Stephan Siemen, Tiago Quintino, Milana Vuckovic, James Hawkes	Brussels, Belgium	1-2 Feb 2020
EGU 2020	Presentation at conference	Big data and machine learning in geosciences	John Hanley, Milana Vuckovic, Stephan Siemen, James Hawkes, Tiago Quintino, Florian Pappenberger	Virtual	4-8 May 2020
ICCS, Multiscale Modelling and Simulation Workshop	Presentation at conference	Building cloud-based data services to enable earth-science workflows across HPC centres	Milana Vuckovic, John Hanley, Stephan Siemen, James Hawkes, Tiago Quintino and Florian Pappenberger	Virtual	11-12 June 2020
Using ECMWF's Forecasts (UEF2020)	Participation to an event other than a conference or workshop – poster	Building cloud-based data services to enable earth-science workflows across HPC centres	Milana Vuckovic, John Hanley	Virtual	1-4 June 2020
JupyterCon 2020	Poster at conference	Training users of weather and climate data through Jupyter Notebooks	Stephan Siemen, Baudouin Raoult, Iain Russel, Sylvie Lamy-Thépaut,	Virtual	12-16 October 2020

Title of conference / workshop / training / other event	Type	Title of presentation / poster / other	Authors	Place	Date
			Milana Vuckovic, Manuel Martins, Carlos Valiente		
Sixth IEEE International Conference on Big Data Computing Service and Machine Learning Applications	Presentation	Content-based Analytics: Moving Beyond Data Size	D. Tsoumakos and I. Giannakopoulos	Virtual	4-6 August 2020
ICCS-MMS-VVUQ	Presentation	Urban Air Pollution multiscale simulation and uncertainty quantification	Zoltán Horváth, László Környei, Bence Liszkai, Ákos Kovács, Tamás Budai, and Csaba Gáspár	Virtual	11-12 June 2020
Social Simulation Week 2020: Workshop on Simulation in the times of COVID-19	Presentation	Covid-19 Simulation Flu and Coronavirus Simulator (FACS)	Imran Mahmoud, Derek Groen	Virtual	16 September 2020
ICCS-MMS-VVUQ	Presentation	Running Coupled Simulations on HPC and Cloud Resources with Enhanced TOSCA Workflows	F. Javier Nieto, Sergiy Gogolenko	Virtual	11-12 June 2020
FocusCoE Sustainabiltiy Workshop	Presentation	Creating value solving Global Challenges	Lara López	Virtual	5 November 2020
Supercomputing Akademie – Daten : Management und Analyse	Presentation	Konvergenz von HPC und Künstlicher Intelligenz	Dennis Hoppe	Virtual	14 October 2020
SC20	Presentation	HiDALGO: Addressing Global Challenges with HPC and Big Data Technologies	Dennis Hoppe, Derek Groen	Virtual	17 November 2020

Other events and dissemination types

Table [25]: Other events

Title of event	Content of event	Place of event	Date of event	Representatives of HiDALGO
Symposium: Urban Systems Global Challenges Digital Tools, International Symposium Stuttgart	Urban Air Quality Modelling and Management: Case Study of Győr	Stuttgart, Germany	29 May 2019	Zoltán Horváth
Symposium: Urban Systems Global Challenges Digital Tools, International Symposium Stuttgart	HiDALGO: Synthetic Information Systems - Opportunities and obstacles	Stuttgart, Germany	29 May 2019	Michael Gienger
Symposium: EBDVF - European Big Data Value Forum	ATOS had a booth there and included a poster and some flyers, as well as a presentation	Helsinki, Finland	14 – 16 Oct 2019	Lara López
Symposium: Forum for air quality modelling in Europe (FAIRMODE) plenary meeting	SZE participated in the meeting as participant and had discussions and demonstration at group level. SZE joined the CT4 Microscale modelling activity group and performed a demonstration to the group leader.	Berlin, Germany	18 – 19 Feb 2020	Zoltán Horváth
Symposium: Forum for air quality modelling in Europe (FAIRMODE) technical meeting	SZE was an invited speaker at the CT4 session where SZE presented the HiDALGO UAP results. SZE officially applied for hosting the Intercomparison Exercise of FAIRMODE to be held at EU level. The HiDALGO demonstration domain Győr and Antwerp are the competitors for the exercise; in	Online, hosted by NILU, Oslo	9 – 10 Feb 2020	Zoltán Horváth

Title of event	Content of event	Place of event	Date of event	Representatives of HiDALGO
	December 2020 will be a hackathon for decision.			
Pitch event: Atos Digital Show	Presentation of the research portfolio and its application to existing commercial solutions	Online, only for Atos employees	23 – 26 Nov 2020	Lara Lopez, Javier Nieto

Table [26]: Other dissemination types

Type	Title	Content	Authors	Date	Place
Press release	Uniprofessor ist ein Mann der großen Daten	A short description of the use case pilot social networks.	Sandra Aigner	18 Jan 2019	Newspaper, Kronenzeitung, Austria
Press release	Universität Salzburg an 8 Millionen Großprojekt zu Big Data Technologien beteiligt	A short description of the use case pilot social networks.	Gabriele Pfeifer	18 Dec 2018	Austrian Press Agency (APA)
Non-scientific and non-peer reviewed publication (popularised publication)	Solving global challenges with high-performance computing and data analytics	A presentation of the project's objectives and the HiDALGO pilots	Konstantinos Nikas	16 April 2019	HiPEAC Info magazine (vol 57)
Non-scientific and non-peer reviewed publication (popularised publication)	Climate refugees: Why we can't yet predict where millions of displaced people will go	An article in the Conversation	Derek Groen and Diana Suleimenova	28 Nov 2019	The Conversation
Non-scientific and non-peer reviewed publication (popularised publication)	Climate refugees: Why we can't yet predict where millions of displaced people will go	The Conversation article reposted on the Yahoo News	Derek Groen and Diana Suleimenova	Reposted from the Conversation on 28 Nov 2019	Yahoo News

Type	Title	Content	Authors	Date	Place
Flyer	Optimize your Telecommunication Business with HPC & HPDA	A flyer about the objectives of the HiDALGO project in the telecommunication field context	Bülent Tokgöz	10 Nov 2019	GCCM Cap Town
Non-scientific and non-peer reviewed publication (popularised publication)	Simulating COVID-19 and flu spread using HiDALGO. Or how technology can support decision-making for an effective response to a pandemic	Article in the HiPEAC magazine abotu the COVID-19 use case	Lara Lopez	5 Nov 2020	HiPEAC Info 61

Organisation of workshops etc.

In January 2020 a first workshop was organised by HiDALGO at the HiPEAC conference.

	HiPEAC January 2020 workshop and hands-on session
Type / format	Interactive workshop and hands-on session
Aim	• Advertise HiDALGO • Dissemination of case study results • Receive feedback to the case studies, discuss with attendees
Venue & date	21 January 2020, Bologna
Target group	Academia, HPC, Industry, Tool builders, Computer architects
Content	• Introduction incl. a presentation of the Portal and services • Presentation of all three case studies • Hands-on part on the urban air pollution case study • Wrap-up / discussion
Experiences	Several contacts were established to other projects; however, the audience was not as eager to discuss as we had hoped for.

A second workshop at the HiPEAC conference will be held in January 2021 (online).

	HiPEAC January 2021 workshop
Type / format	Interactive workshop
Aim	• Dissemination of HiDALGO Portal and results • Support the creation of a community around HPC / HPDA / AI and GC
Venue & date	20 January 2021, virtual
Target group	Academia, HPC, Industry, Tool builders, Computer architects
Content	• Introduction to the Project HiDALGO and its Portal • Invited presentation about epidemiology • Presentation of new CS: Simulating the Spread of Covid-19 in Urban Areas • Invited presentation (ESiWACE): Preparing European Weather and Climate Models for Exascale • AI: Route Pruning Algorithm for Location Graph Construction

In year 3 a multi-day workshop is planned. The aims are to provide a forum for exchange for people interested in global challenges, networking, dissemination and training. Other projects and institutes are invited to give talks. EoCoE and ESiWACE already agreed. HiDALGO project partners involved in the planning hope that it will be possible to hold the workshop face to face – depending on the restrictions due to the Covid-19 pandemic.

	Tackling global challenges by use of HPC / HPDA and AI
Type / format	Multi-day workshop
Aim	• Dissemination, Networking, Training • Provide a forum for exchange for people interested in global challenges • Getting together people from different perspectives of global challenges • Raising awareness of global challenges
Venue & date	• Salzburg, July 2021
Target group	• Simulation community – simulating global challenges • HPC / HPDA / AI communities
Content	• Talks and training on several sub-topics • Societies, Health, Sustainability, Climate change
Expectations	• Communities will mix • Create awareness for global challenges, Dissemination