



OPEN ACCESS

EDITED BY

Shraddhanand Shukla,
University of California, Santa Barbara,
United States

REVIEWED BY

Rafael Mattos Dos Santos,
University of Guelph, Canada

*CORRESPONDENCE

Josee Poirier
josee.poirier@un.org
Zinta Zommers
zommers@un.org

SPECIALTY SECTION

This article was submitted to
Climate Services,
a section of the journal
Frontiers in Climate

RECEIVED 29 April 2022

ACCEPTED 19 October 2022

PUBLISHED 08 December 2022

CITATION

Chaves-Gonzalez J, Milano L,
Omtzigt D-J, Pfister D, Poirier J,
Pople A, Wittig J and Zommers Z
(2022) Anticipatory action: Lessons for
the future. *Front. Clim.* 4:932336.
doi: 10.3389/fclim.2022.932336

COPYRIGHT

© 2022 Chaves-Gonzalez, Milano,
Omtzigt, Pfister, Poirier, Pople, Wittig
and Zommers. This is an open-access
article distributed under the terms of
the [Creative Commons Attribution
License \(CC BY\)](#). The use, distribution
or reproduction in other forums is
permitted, provided the original
author(s) and the copyright owner(s)
are credited and that the original
publication in this journal is cited, in
accordance with accepted academic
practice. No use, distribution or
reproduction is permitted which does
not comply with these terms.

Anticipatory action: Lessons for the future

Juan Chaves-Gonzalez¹, Leonardo Milano^{1,2},
Dirk-Jan Omtzigt¹, Daniel Pfister¹, Josee Poirier^{1,2*},
Ashley Pople¹, Julia Wittig¹ and Zinta Zommers^{1*}

¹United Nations Office for the Coordination of Humanitarian Affairs, New York, NY, United States,

²Centre for Humanitarian Data, United Nations OCHA, The Hague, Netherlands

Climate shocks are causing increasingly severe damage and amplifying humanitarian needs. So far, humanitarian action has been mostly responsive, arriving after a crisis has materialized. With recent advances in forecasting, humanitarian and development organizations have been able to anticipate and respond ahead of crises. “Anticipatory action” (AA) seeks to ensure aid is provided before the peak impact of a shock occurs, reducing suffering and humanitarian needs. The UN Office for the Coordination of Humanitarian Affairs (OCHA) has been developing AA frameworks since 2019, coordinating collective AA and mobilizing finance. To date, these pilots have reached approximately 2.2 million people in Somalia, Ethiopia and Bangladesh. In six countries (Bangladesh, Burkina Faso, Malawi, Nepal, Niger, and The Philippines), frameworks are in place to reach a further 2.3 million people should the triggers be reached. OCHA is facilitating the design of AA plans in Chad, the Democratic Republic of the Congo (DRC), Madagascar, Mozambique and South Sudan. We share lessons from the pilots, focusing on three components: triggers, programming, and financing. We report that triggers must be sufficiently reliable to warrant action and funds disbursement. Forecasts are not available for all countries or hazards, and existing forecasts may not provide desired resolution or skill (accuracy) levels, especially at longer lead times. The timing of action therefore must balance forecast skill against operational needs. Funding is best when it is flexible and includes finance for framework design, evaluation and continued improvements. Finally we discuss the challenges and opportunities in scaling up AA.

KEYWORDS

anticipatory action, predictive analytics, financing, humanitarian programming, humanitarian response, climate shocks, climate change

Introduction

Since 2006, the UN’s Central Emergency Response Fund (CERF) has been used to address the impacts of 406 different climate and natural disaster-related events, totaling over USD \$1.9 billion (an average of 26 percent of CERF funding per year). This does not include funding for compound crises, in which climate interacts with other shocks such as conflict. Losses and damages are only expected to grow with increasing temperatures ([Intergovernmental Panel on Climate Change, 2022](#)). By 2030, we may

require an additional \$20 billion annually for the international humanitarian response to climate-related disasters [International Federation of Red Cross and Red Crescent Societies (IFRC), 2019].

The humanitarian system reaches more than 100 million people a year and saves millions of lives [Office for the Coordination of Humanitarian Affairs (OCHA), 2021]. However, the majority of humanitarian action is primarily responsive, including the part of it that addresses climate-related losses and damages (Table 1). With recent advances in data availability, predictive analytics and early warning systems, there is an opportunity to act earlier and faster, even before the shock occurs. We can anticipate and provide assistance ahead of the peak impacts of shocks to minimize or avert impacts and build resilience.

Anticipatory approaches have gained significant momentum over the past decade and are being developed in over 60 countries. Alongside the Red Cross and Red Crescent network

and WFP’s pioneering work on forecast-based financing, other humanitarian actors such as the Start Network and FAO are funding and implementing similar approaches. Initial projects were relatively small in scale, for example reaching 350 households (Jjemba et al., 2018). Since 2018, OCHA has worked with donors, implementing organizations, governments and experts to help scale action and promote change toward a more anticipatory system. This included an initial commitment of up to \$140 million from CERF to develop 12 pilot anticipatory action frameworks for different shocks, including drought, flooding, cyclones and communicable disease outbreaks (Figure 1). Between July 2020 and June 2022, 2.2 million people in Somalia, Ethiopia, and Bangladesh were reached through OCHA-facilitated AA. CERF spent just over \$60 million on these pilots, <6% of its total spend over the same period. OCHA has also finalized frameworks in Burkina Faso, Nepal, Niger, the Philippines, Malawi, covering more than 2.3 million people and providing \$58.5 million of pre-arranged finance for action, should triggers be reached.

The primary objective of these pilots is to generate evidence on the feasibility and impact of taking AA at a large scale, as previous pilots have often been much smaller both in funding and in number of beneficiaries reached. As a result of this work, evidence has been mounting that anticipatory action is an appropriate tool for wide-spread use (Gros et al., 2019, 2022; Pople et al., 2021). It is fast, efficient, effective, and dignified humanitarian action. It can protect hard-won development gains, and contribute to greater accountability and localization. However, the pilots have also shown that upfront preparatory work in setting up AA is critical and time consuming.

TABLE 1 Comparison of humanitarian action types.

| | Humanitarian action | |
|------------------|--|--|
| | Responsive | Anticipatory |
| Timeline | After a shock | Before shock or peak impact |
| Basis for action | Observed humanitarian impacts | High risk of imminent shock and/or early indicators of weather impacts |
| Financing | Upon request | Pre-agreed |
| Activities | Selected to address currently existing needs, based on what is feasible and available at that point in time | Pre-agreed; timed to mitigate the impact of shock; additional time to plan may allow for a wider set of possible activities |
| Trigger | Needs-based: assessed humanitarian impacts | Risk-based: Pre-agreed levels of risk (predicted or observed) |
| Challenges | Aid delivery may be more difficult after a shock such as a storm or flood; beneficiaries may lack the resources to protect themselves against the shock itself (e.g., to move out of the danger zone before a storm) | Forecasts and risk/early warning data not available for all contexts or hazards; forecast skill or lead time may be insufficient; the situation on the ground may differ from the projection |
| Opportunities | Further acceleration of aid delivery Reduction in uncertainty on the specific nature, scale, location of impacts | Lead time enables consultation and inclusion of communities in planning Earlier aid delivery empowers local people to decide and act on the best way for them to respond to the shock |

Trigger considerations

Anticipatory action hinges on the ability to design an acceptable trigger (Coughlan de Perez et al., 2014; see examples

TABLE 2 Example of a hybrid (predictive and observational components) anticipatory action trigger mechanism for drought in Chad.

| Trigger type | Hybrid trigger mechanism | |
|----------------------|--|--------------------------|
| | Predictive | Observational |
| Period examined | July–August–September | April–August |
| Activation decisions | Once monthly (Mar–June) | Once in September |
| Indicator | 3-month forecast of total rainfall | Biomasse anomaly |
| Return period | Estimated 1 in 4 years | 1 in 4.8 years |
| Threshold | 42.5% probability of below average rains in at least 20% of region of interest | 80% of long-term average |



of triggers in Table 2). A trigger is viable if there is data of sufficient quality to set a threshold for action, and if it leads to an appropriate, timely decision to act. Historical (climate, agro-meteorological, vulnerability, exposure, damage or loss) data is needed to understand the location, timing and severity of past shocks. Lacking, incomplete, or insufficiently granular data (Centre for Humanitarian Data, OCHA, 2022) impedes the definition of an “out-of-the-ordinary” event. Forecast skill tends to come at the expense of lead times, a vexing tradeoff to balance when deciding whether to initiate a time-sensitive response in operationally difficult contexts. Historical forecasts are critical to estimate trigger performance: how often a trigger should be expected to be met, and how often it is expected to correctly and incorrectly recommend taking action.

The operational cost of error (recommended inaction when a shock does occur or recommended action when no shock occurs) is complex, case-specific, and mainly determined by factors unrelated to the trigger such as financial risk or capacity to recover from an act-in-vain scenario. Yet that cost is embedded in the trigger whose parameters reflect risk aversion and the type of error that is easier and/or more desirable to avoid. Unknowns, risks, and assumptions must be documented so as to transparently acknowledge the built-in tradeoffs and mitigate the risk of error (see for example an actuarial review of a dry spells trigger, Meusz, 2022). A phased approach in which signals are evaluated over time and tied to time-specific activities, the reduction of budgetary envelope, the addition of an observational trigger as a fail-safe, and/or the selection of activities that are less costly or that can be beneficial even in the absence of the forecasted shock are examples of risk-mitigating

strategies. Trigger governance must be clearly detailed to ensure reliable monitoring and rapid alerting should the trigger be met. An evaluation of the trigger post risk season should establish whether the decision to (or not to) act was appropriate and timely.

Scaling up anticipatory action raises a host of technical challenges and opportunities. As triggers extend to new shocks and contexts, additional expertise, data, and collaborations must be developed. Certain technical questions become more pressing due to climate change, such as whether erratic rainfall patterns should be treated as a shock or how thresholds should be corrected to reflect more recent trends. These needs amplify the importance of strong partnerships with climate scientists who can provide context-specific insights and technical nuances critical to defining a trigger. Long-term investments in the data ecosystem are crucial to improve triggers and evaluate the impact of AA, and require engagement with numerous actors, including the development sector. Relatedly, stronger partnerships with local governments, meteorological and hydrological services, disaster management, and other local or regional authorities are needed to enable information sharing and coordination (note that all technical work performed by OCHA is open source and can be accessed online at centre.humdata.org/anticipatory-action). Buy-in and trust must be built through close collaborations for the commitment to act on a trigger to translate into actual action. The role of technical translators is markedly important in turning data into practical decision-making: translators reduce terminology clashes and scientific complexity by connecting climate science to humanitarian programming and funding considerations,

thereby facilitating multidisciplinary communications and the design of viable, effective triggers.

Programming considerations

Impactful AA delivers the right assistance at the right time, so that people have the resources and knowledge to navigate extreme shocks on their own terms. The quality of AA depends in large part on the preparatory work that is invested upfront to develop the programmes. Coordination during the design and implementation phase is the critical ingredient that ensures that the “whole is greater than the sum of its parts,” such as through joint targeting and the delivery of multi-sector packages.

Three programming considerations are particularly critical: timing, activity selection, and targeting.

First, the key feature that distinguishes AA is the timing of the humanitarian action. By acting earlier in the shock trajectory, AA widens the choice set of options available to households to mitigate the shock impact (Pople et al., 2021). The triggers should thus be designed to balance forecast performance against the lead time needed for operational readiness and the choices available to households at different points in time. To identify windows of opportunity, we have used crisis timelines to map out the evolution of the shock, the resulting humanitarian needs and the key moments in which action could change the course of the shock impact.

An impact evaluation led by the University of Oxford and the Center for Disaster Protection (Pople et al., 2021) found that cash transfers received in advance of extreme flooding in Bangladesh not only provided immediate relief by protecting food security, but also helped households to change their behaviors to mitigate the flood impact. After 3 months, recipient households had higher food consumption, wellbeing and earning potential compared to non-beneficiaries. These effects were largest for households who received the cash earlier relative to the flood trajectory. However, the evidence base on the optimal timing of response remains slim and continued learning is needed.

Second, with longer time horizons to plan for action, AA creates an opportunity to select the most impactful activities, which not only respond to immediate needs but also build resilience. A large body of literature shows the effectiveness of cash in cushioning the negative income effects of shocks, including humanitarian settings (de Janvry et al., 2006; Del Carpio and Macours, 2010; Aker et al., 2016; Asfaw et al., 2017; Doocy and Tappis, 2017; Jensen et al., 2017). It is fungible, can be easily delivered through mobile technology, and is portable during displacement. In-kind assistance may be effective in cases that require investments into infrastructure and other public goods (such as the construction of boreholes in response to droughts or flood dikes), or when disasters disrupt the functioning of markets. Anticipatory action has provoked important questions about the quality of assistance provided

(such as the size of the cash transfer in the case of the Bangladesh study or the value of bundling goods or services) and the expected duration of its impact in a protracted crisis setting.

Operational readiness—the ability to act quickly upon trigger activation—is the key constraint on the selection of activities, especially in sudden onset disasters. Although funding can be released almost immediately upon a trigger activation, the lengthy process of procuring and pre-positioning items can delay the time taken for the funding to move into the hands of those being targeted. In sudden onset disasters, the OCHA-facilitated AA pilots have approached this challenge by funding time-bound “readiness activities.”

Lastly, identifying and targeting the most vulnerable households can present challenges. Anticipatory action presents a trade-off between maximizing impact by acting earlier and maximizing targeting accuracy by identifying which households are most impacted by the shock ex-post. Targeting decisions are made on the combination of baseline vulnerability and the shock impact. Given that the latter is challenging to predict in data-scarce environments, targeting to date has typically focused on baseline vulnerability. Often, baseline vulnerability is so high that we adopt a “no regrets” approach, meaning that even if the shock does not materialize as expected, the assistance will still have a positive impact. By acting earlier, AA provides the time and space needed to conduct joint targeting across multiple UN agencies, which is usually difficult in an urgent response. Joint targeting is being piloted in numerous OCHA-facilitated pilots, such as in Bangladesh, Chad and Niger. Moreover, advanced planning creates time for consultations and for the coordination of assistance that is inclusive and responds appropriately to the most urgent needs of those affected by crises. During the design of frameworks in Malawi, Nepal and the Philippines, OCHA asked people what type of assistance they would like to receive and when.

Financing considerations

An element that differentiates AA from responsive humanitarian action and from contingency planning is pre-agreed financing. Based on the experience of the OCHA-managed CERF in AA pilots, there are six key learnings around enabling effective AA financing.

First, there are significant advantages to adapting established funding instruments instead of creating parallel funding structures for AA. CERF’s funding allocation process has been refined over more than 15 years and recipient agencies as well as humanitarians in countries of operations trust and rely on this process. The main changes made to enable AA financing include frontloading the entire process (application preparation, submission, review and approval) and adapting project budgets to reflect trigger stages in sudden-onset emergencies.

Second, there are ways to manage the financial risk associated with forecast uncertainty. For sudden onset

emergencies, CERF manages this risk by (a) relying on two-stage trigger mechanisms with a readiness and an action stage and (b) ring-fencing funds associated with the second (“action”) stage. For slow onset emergencies—where different activities have different windows of opportunity distributed over longer timelines—CERF has adopted a phased approach, whereby separate sets of activities are disbursed at different moments in time, making use of the best available forecast at that moment.

Third, AA relies on preparedness which is outside the funding criteria of many humanitarian financing instruments, including CERF. The difficulty here is that preparedness activities have to be carried out before trigger thresholds are reached and CERF can only fund action after the trigger has been reached. Preparedness must also take place regardless and there will be seasons when preparedness activities are not followed by an AA trigger. In order to further scale up AA, it will be key to understand preparedness and pre-positioning requirements, and explore complementary financing options; failure to find such funding streams may preclude certain AA-type activities from being included in a plan.

Fourth, physical movement of money is slow and for scaling up AA partners may need to step up themselves. If the window of opportunity is very short (e.g., seven days), the physical movement of funds from CERF to UN agencies (and to their partners) can be a bottleneck. For sudden onset pilots, certain AA activities are only feasible if the agency (and its implementing partners) has sufficient capital to pre-finance the activities pending the transfer of CERF funds.

Fifth, unearmarked funding increases efficiency. Most shocks currently covered by AA have a seasonality to them, that is periods when there is a risk of a shock occurring and periods when the shock will definitely not occur (e.g., rainfall seasons, hurricane seasons, etc.). In addition, AA is meant to address extraordinary shocks that do not occur on a standard basis. So, instead of keeping money for AA in a separate pot—where it may lay idle for long periods—CERF has funded AA out of the larger pot that also covers responsive action. In combination with good cash flow planning, this has meant that funds could be used any moment where they were most needed and could have the greatest impact.

Finally, AA also requires investment in the design of plans or frameworks and in evaluation and learning. The humanitarian sector is traditionally relatively devoid of rigorous impact evaluations. Learning from OCHA’s AA pilots increases accountability and can be used to improve programming.

Discussion

The OCHA-facilitated pilots indicate that AA can be an effective approach to mitigate humanitarian impacts resulting from shocks where there is data and forecasts of sufficient quality to provide predictive signals.

The approach can be more limited but still add value in contexts where the data landscape is poor and there is no clear signal indicating an imminent extreme event. For instance, OCHA opted not to develop a formal AA framework for floods in South Sudan due to lack of validated flood forecasts and data scarcity. However data analysis was still used to activate action to mitigate the impact of foreseeable unprecedented flooding in areas most at risk ahead of the upcoming rainy season.

AA cannot yet cover the full range of risks that affect individual households, nor has it yet addressed compound shocks. The drivers of humanitarian crises are becoming increasingly more complex and interconnected over time, requiring solutions that equivalently account for the multi-shock reality that people face, ranging from extreme weather shocks to disease to conflict. The design of a multi-shock trigger presents significant technical challenges as the interplay between shocks is not yet well documented (e.g., co-occurrence frequency, cascading or compounding effects on humanitarian needs) or forecastable. Whereas our pilots have shown the importance of linking the trigger to the expected humanitarian impact, a study on AA in Somalia found that it was difficult to use a trigger that directly measures the impact of multiple shocks (food insecurity), as it was not evident what should be the most impactful actions to address the drivers of humanitarian need (Getliffe, 2021).

Nevertheless, there is evidence that AA may be effective in contexts where shocks are recurrent or cyclical. Interventions that reduce the impact of the shock have been shown to facilitate a quick recovery, sustaining resilience to future shocks (Jemba et al., 2018; Pople et al., 2021). Moreover, initial investments have created both the infrastructure and mindset for acting earlier in a crisis, as evidenced by the integration of AA within government structures in Bangladesh. Uncertainty in the timing of humanitarian action is often driven by unpredictable operational delays. AA forces forward thinking and planning ahead to ensure agreements with implementing partners and procurement are already in place substantially reduces the unpredictability in the timing of humanitarian response.

Ultimately, AA should be considered one of many policy levers used to build resilience in response to increasingly severe events. Longer-term strategies that reduce vulnerability, such as disaster risk reduction and poverty alleviation, are also needed. AA should be integrated into other structures, including formal government social safety nets.

In the interim, we will continue to work toward the goal set out by OCHA’s Under-Secretary General Martin Griffiths in September 2021 that “the humanitarian system should be as anticipatory as possible and only as reactive as necessary.” The lessons learned from the pilots and consultations with over 60 humanitarian staff have informed a path forward to mainstream AA into regular humanitarian programming. We will continue to improve and expand triggers. We will continue to revise programming so that AA design is as flexible and as light as possible, better involving communities and local experts. We will

continue to search for innovative ways to sustainably finance collective approaches. Fulfilling the potential of AA requires partners and donors to continue to invest in early warning systems and data, to provide more flexible funding and even pre-commit a proportion of their humanitarian budget toward AA as an initial target for scale up. Most importantly, the impact arising from AA will only improve over time, especially if we commit to rigorous learning, both from the failures and successes along the way.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

DP, AP, JW, and ZZ contributed to the programming and financing consideration sections. LM and JP contributed the trigger consideration section. JP, AP, and ZZ led the drafting of the abstract, introduction, and discussion. J-CG contributed

References

- Aker, J. C., Boumniel, R., McClelland, A., and Tierney, N. (2016). Payment mechanisms and antipoverty programs: evidence from a mobile money cash transfer experiment in Niger. *Econ. Dev. Cult. Change* 65, 1–46. doi: 10.1086/687578
- Afaw, S., Carraro, A., Davis, B., Handa, S., and Seidenfeld, D. (2017). Cash transfer programmes, weather shocks and household welfare: evidence from a randomised experiment in Zambia. *J. Dev. Effect.* 9, 419–442. doi: 10.1080/19439342.2017.1377751
- Centre for Humanitarian Data, OCHA. (2022). *The State of Open Humanitarian Data*. Available online at: <https://centre.humdata.org/stateofdata2022> (accessed June 23, 2022).
- Coughlan de Perez, E., Van den Hurk, B., van Aalst, M., Jongman, B., Klose, T., and Suarez, P. (2014). Forecast-based financing: an approach for catalyzing humanitarian action based on extreme weather and climate forecasts. *Nat. Hazards Earth Syst. Sci.* 15, 895–904. doi: 10.5194/nhess-15-895-2015
- de Janvry, A., Finan, F., Sadoulet, E., and Vakis, R. (2006). Can conditional cash transfer programs serve as safety nets in keeping children at school and from working when exposed to shocks? *J. Dev. Econ.* 79, 349–373. doi: 10.1016/j.jdeveco.2006.01.013
- Del Carpio, X. V. and Macours, K. (2010). “Leveling the intra-household playing field: compensation and specialization in child labor allocation”. In *Child Labor and the Transition between School and Work (Research in Labor Economics, Vol. 31)*, eds Akee, R. K. Q., Edmonds, E. V. and Tatsiramos, K. (Bingley: Emerald Group Publishing Limited), 259–295. doi: 10.1108/S0147-9121(2010)0000031012
- Doocy, S., and Tappis, H. (2017). Cash-based approaches in humanitarian emergencies: a systematic review. *Campbell Syst. Rev.* 13. doi: 10.4073/csr.2017.17
- Getliffe, E. (2021). *UN OCHA Anticipatory Action: Lessons from the 2020 Somalia Pilot*. Available online at: https://www.disasterprotection.org/s/WP_9_17Feb.pdf (accessed June 23, 2022).
- Gros, C., Bailey, M., Schwager, S., Hassan, A., Zingg, R., Uddin, M. M., et al. (2019). Household-level effects of providing forecast-based cash in anticipation of extreme weather events: quasi-experimental evidence from humanitarian interventions in the 2017 floods in Bangladesh. *Int. J. Disaster Risk Reduct.* 41. doi: 10.1016/j.ijdrr.2019.101275
- Gros, C., Easton-Calabria, E., Bailey, M., Dagys, K., de Perez, E. C., Sharavnyambuu, M., et al. (2022). The effectiveness of forecast-based humanitarian assistance in anticipation of extreme winters: evidence from an intervention for vulnerable herders in Mongolia. *Disasters*. 46, 95–118. doi: 10.1111/disa.12467
- Intergovernmental Panel on Climate Change [IPCC: Pörtner, H.-O., Roberts, D. C., Tignor, M., Poloczanska, E. S., Mintenbeck, K., Alegría, A., Craig, M., Langsdorf, S., Löschke, S., Möller, V., Okem, A., Rama, B., et al.]. (2022). “Climate Change 2022: Impacts, Adaptation, and Vulnerability,” contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press.
- International Federation of Red Cross and Red Crescent Societies (IFRC). (2019). *The Cost of Doing Nothing: The Humanitarian Price of Climate Change and How it can be Avoided*. Available online at: <https://www.ifrc.org/sites/default/files/2021-07/2019-IFRC-CODN-EN.pdf> (accessed 23 June, 2022).
- Jensen, N. D., Barrett, C. B., and Mude, A. G. (2017). Cash transfers and index insurance: a comparative impact analysis from northern Kenya. *J. Dev. Econ.* 129, 14–28. doi: 10.1016/j.jdeveco.2017.08.002
- Jjemba, E., Mwebaze, B., Arrighi, J., Coughlan de Perez, E., and Bailey, M. (2018). “Forecast-based financing and climate change adaptation: Uganda makes history using science to prepare for floods,” in *Resilience: The Science of Adaptation to Climate Change*, eds Z. Zommers, K. Alverson (Cambridge, MA: Elsevier), 237–242. doi: 10.1016/B978-0-12-811891-7.00019-0
- Meusz, J. (2022). ‘Malawi dry spells anticipatory action trigger’, *Quality Assurance review, Centre for Disaster Protection and Government Actuary’s Department, London*. Link to paper: https://drive.google.com/file/d/1twazEUKXL_5OG0_IFfsq11e1URMRIE_F/view. Available online at: <https://centre.humdata.org/anticipatory-action/>
- Office for the Coordination of Humanitarian Affairs (OCHA). (2021). *OCHA Annual Report 2021*. Available online at: <https://www.unocha.org/story/ocha-launches-annual-report-2021> (Accessed 23 June, 2022).
- Pople, A., Hill, R., Dercon, S., and Brunckhorst, B. (2021). Anticipatory cash transfers in climate disaster response. CSAE Working Paper WPS/2021-7. Available online at: https://www.disasterprotection.org/s/FINALAnticipatory_Cash_Transfers_in_Climate_Disaster_ResponseforWPF3.pdf (accessed 23 June, 2022).

to the discussion. JP and ZZ led the manuscript revision. All authors provided input on the manuscript and read and approved the submitted version.

Conflict of interest

The Centre for Humanitarian Data has a paid consultancy relationship with Editor Andrew Kruczkiewicz.

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher’s note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.