Institution: Liverpool John Moores University (LJMU)		
Unit of Assessment: UOA34		
Title of case study: Racing the King Tide – Documenting Adaptation to Sea Level Rise		
Period when the underpinning research was undertaken: 2017 – Present Day		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	**Role(s) (e.g. job title):**	**Period(s) employed by submitting HEI:**
Christopher Chadwick	Senior Lecturer in Media Production	2017 - present
Period when the claimed impact occurred: 2017 – Present Day		
Is this case study continued from a case study submitted in 2014? N		

1. Summary of the impact

Racing the King Tide (www.racingthekingtide.com) is an international research project that re-frames the approach to adaptation to sea-level rise. The first hand experiences of Islanders in Tubigon, Philippines adapting to sea-level rise (SLR) caused by the 2013 Bohol earthquake are documented through film, photography, 360VR and academic publications.

The four islands (total population: 2421) affected by the continuous flooding have benefitted from impact evidenced at local level through financial aid apportioned for infrastructure changes in raising the classrooms floors and roads on the islands. The project has also influenced policy change at local and national Philippine government level in terms of adaptation to sea level rise and community migration. The project has had significant impact on reframing the international debate on sea level rise and the UN's intervention in this policy area. The documentaries have been used by the UNCTAD as;

> "… one of the important resources of interest to stakeholders across the world consulting the website for information, tools and guidance on issues related to climate change impacts and adaptation …" UNCTAD [S.10]

2. Underpinning research

Racing the King Tide (RTKT) is an international research project [R1,R2] that investigates the issues of adaptation to sea level rise [R3,R4,R5 and R6] and community migration [R3,R6] of small islands in the central Philippines. The research focuses on the four low-lying atoll islands of Ubay (Population: 223), Pangapasan (Population: 623), Bilangbilangan (Population: 529) and Batasan (Population: 1,046) who experience severe tidal flooding induced by the 7.2 magnitude 2013 Bohol earthquake. Due to land subsidence as a result of the earthquake, the islands suffer complete flooding during the spring 'King' tides [R1, R2] (June, July & August) and partial flooding throughout the rest of the year. (Batasan and Ubay: 135 flood days per year, Pangapasan and Bilangbilangan: 44 flood days per year).

Key research insights or findings that underpinned the impact

The initial research utilized a series of film documentaries (8 films [R1, R2]) to illustrate the resilience of the islanders to sea level rise (SLR) through 'in-situ adaptation'. The films document their response to SLR with in-situ coping strategies thus helping reframe the traditional alarmist narrative of SLR and community migration [R3, R4, R5 and R6]. These insights lead us to 'Rethink the Limit to Climate Change Adaptation' [R3].

The research explores how the islanders have tackled SLR and rather than abandon their homes and communities, they choose to stay through effective in-situ adaptation rather than migrate. 'In-situ adaptation against climate change can enable relocation of impoverished small islands' (R6) and can influence mass migration by reducing vulnerability and increasing the resources needed for successful relocation (R5). This research states it is unlikely that dense coastal settlements will be abandoned in the face of sea level rise. Long-term perspectives about adaptation strategies to SLR are illustrated in 'Adaptation to Sea Level Rise on Low Coral Islands: Lessons from Recent Events' [R5].

The research project also questioned the impact of immersive 360 documentary as a resource to influence the local Philippine Government's response to the detrimental effects of natural disaster. A 360 documentary (played on Oculus VR headsets [R1]) giving voice to the islanders' experiences was produced and played to the local Philippine government. This immersive documentary allows the viewer to 'experience' the impact of the King Tide floods and see first-hand how the islanders have sought to adapt rather than migrate to the mainland. The research found that there was a more profound experience (a sense of place) and enhanced empathy for the islanders through this new innovative form of documentary. The linear documentaries were an important starting point in the project and helped disseminate the narrative at LGU presentations and social media platforms. However, the experiential 360 Documentary gives the viewer an immersive experience where they are actually with the islanders in the submerged waters. This research demonstrates the power of visual communication in shaping the policy debate on a major environmental issue that has both local and global implications.

What research was undertaken, when, and by whom

The research was undertaken from June 2017 during the highest (King) spring tides of the year. The documentary films [R1, R2] were produced with research colleague Philippine scientist Dr Lau Jamero (University of Tokyo) who was the community liaison. Interviews with key contributors on the islands (Captains, teachers, community nutritionist, marine protectionists and community members) informed the narrative of the documentaries [R1, R2] and journals [R3, R4, R5, R6]. Scientific data (annual flood SLR readings, bathymetry and aerial mapping) alongside further community ethnographical data (interviews and focus groups [S.4]) complemented this narrative. The films were published and presented to the Local Government Unit and Islanders in August 2018 and July 2019. The 360 documentary was filmed on the islands in 2019. The immersive documentary experience was presented [R1. Photography - VR Headsets] to the islanders, LGU, the Philippine government (the Bohol Governor and the Provincial Disaster Risk Reduction Manager), NGO's, and stakeholders in March 2020.

Key Researchers

Chadwick C, - Senior Lecturer - Liverpool John Moores University.
Dr. Maurice, L, - Head of the Resilience Collaboratory, Manila Observatory, Philippines.
Professor Esteban, M, - Waseda University, Tokyo, Japan.
Mendana, N, - LGU of Tubigon, Bohol, Philippines.

3. References to the research

All journal articles underwent rigorous peer review prior to publication.

R1. Racing the King Tide – Website, Documentary Films, Photography and 360 VR (VR headsets) http://racingthekingtide.com (Chadwick, C., Esteban, M., Jamero, L., Storey, W - published September 2018)
Racing the King Tide - Documentary Film (8:21 minutes) – 43,702 views https://www.youtube.com/watch?v=gwaS9hlNv5M&t=1s (Chadwick, C., Esteban, M., Jamero, L., - published 31st January 2018)
R2. Racing the King Tide – Documentary Film (8:21 minutes) http://racingthekingtide.com/project/racing-the-king-tide-full-documentary/ (Chadwick, C., Esteban, M., Jamero, L., Storey, W - published September 2018)
R3. Jamero, L., Esteban, M., Chadwick, C. and Onuki, M. (2019) Rethinking the Limits of Climate Change Adaptation, ADB Economics Working Paper Series, No. 584, June 2019. https://www.adb.org/publications/rethinking-limit-climate-change-adaptation, http://dx.doi.org/10.22617/WPS190021-2
R4. Esteban, M., Takagi, H. Jamero, L., Chadwick, C., Avelino, E. Mikami, T., Fatma, D., Yamamoto, L., Thao, N. D., Onuki, M., Woodbury, J. D., Valenzuela, V. P., Crichton, R. (2020) Adaptation to Sea Level Rise: Learning from Present Examples of Land Subsidence. Ocean and Coastal Management, 189; https://doi.org/10.1016/j.ocecoaman.2019.104852
R5. Esteban, M., Jamero, L., Nurse, L., Yamamoto, L., Takagi, H. Nguyen, T. D., Mikami, T., Kench, P., Onuki, M., Nellas, A., Crichton, R., Valenzuela, V. P., Chadwick, C., Avelino, J. E., Tan, N., and Shibayama, T. (2019) *"Adaptation to Sea Level Rise on Low Coral Islands:*

Lessons from Recent Events", Ocean and Coastal Management 168 (35-40). https://doi.org/10.1016/j.ocecoaman.2018.10.031
R6. Jamero, L., Chadwick, C., Tan, N., Esteban, M., Crichton, R., Valenzuela, v. P., Onuki, M., Avelino, J. E. (2019) *In-situ adaptation against climate change can enable relocation of impoverished small islands*, Marine Policy; volume 108 http://doi.org/10.1016/j.marpol.2019.103614

Grants:

Graduate School of Frontier Science Grants, The University of Tokyo, 800000 Yen - £5500, Esteban, M., Racing the King Tide.

4. Details of the impact

Pangapasan Island: Teaching school children as water levels rise *(left)* and school children visit the shop at lunchtime in the King tides *(right)*.

The starting point for the documentaries [R1, R2] was to establish a working relationship with the local island communities to ensure that their stories were being told, their voices heard and that they felt a real sense of involvement and ownership of the films. The research team included Dr Lau Jamero (University of Tokyo) a Philippine national who had established relationships with the islanders when identifying potential community contributors. This community collaboration with the residents underpinned all of the research work. Output from the film making process was one longer documentary (YouTube 43,702 views) and 7 shorter documentaries (Vimeo – 106,253 views).

Impact on Local and National Philippine Government
The research was presented to the Vice Mayor, Governors and stakeholders at a Government meeting (August, 2018) [S.1, S.2, R1, R2]; These initial films were a critical tool in advocating the islanders' over-arching narrative to remain on the islands despite the flooding, but they required assistance to implement their in-situ adaptation strategies. The films had a measurable impact on public policy with recommendations being implemented by Local Government Unit (LGU) in Tubigon, Bohol;

Sir Noel Cano Mendana, Local Government Unit, Tubigon commented *"The research work has helped us a lot in coming up with initiatives that we would like to implement in the islands. The videos, we are showing these to our officials and decision-makers who help influence decision-making in providing help and support. The film of kids playing in the flooded basketball court and the classroom inundated with water during class hours has really helped in getting support to provide funding for raising the flooring of the school classrooms (620,747 PHpesos). Before, even if teachers are already complaining, it does not generate so much support from the decision-makers and local officials. These films and the data coming from research, they can really influence people making decisions to implement something that would alleviate the issues and the problems of the islanders after the earthquake."* [S.1]

Whilst lobbying the local government, the RTKT Teacher's film [S.9 -18K views] was instrumental in showing the effect that sea-level rise had on the children on the islands whilst in school 'Tidal floods distract students from their lessons, bringing human waste and high waves into the

classroom'. The lobbying of the Municipality resulted in the propagation of further financial aid (620,747 PHpesos) to the islands for infrastructure improvements including raised main roads on the islands so people could still move around in high tides and elevating the classrooms so that the students (773 children) could be taught all year round even in high floods. The classroom plans were designed and implemented in Batasan (2019, [S.1]) by the LGU chief engineer Sir Noel Mendana. He also designed communal toilets with septic tanks [S.1] that were installed on Pangapasan where no public toilets previously existed (2020 Cost: 450,000 Pesos). The projects were built as a direct response of the LGU seeing our research presentations and viewing the films and 360 documentary. This had significant impact on the population of the four islands with cleaner hygienic communal toilets, raised classroom floors and raised island main roads (Populations: Batasan - 1,046. Ubay - 223. Pangapasan - 621. Bilangbilangan - 529.)

Impact on the Environment

After the earthquake, many households resorted to coral mining to elevate the floors. Excessive coral mining negatively impact fish population and also endangers peoples' lives. Corals serve as natural barriers against waves, protecting the island from typhoons and storm surges. Our research, films and discussions with the Municipality and the island communities [S.4] have promoted new interventions regarding the problem of tidal flooding [R3, R4, R5]. New road building programmes have refrained from using coral stones in order to curb the impact of coral mining in the area [S.1, S.2].

Sir Victor Boligao, Local Government Unit, Tubigon said "We now have programs and funding for elevation of road networks, for building seawalls in some of the islands, for raising the floorings of classrooms in the islands so that the water will not enter the classrooms during class hours." [S.2]

As a result, new projects on the islands have now made it a point to use stones that have been sustainably sourced from the mainland instead [R.3]. The communities are encouraged to build more stilted houses instead which is better for the environment. Through sustainable sourcing of materials rather than mining from the coral reef has resulted in a more environmentally sensitive, effective and safer approach to adaptation to sea level rise.

Impact on International Community

The project [R1, R2] has had considerable impact on media coverage of climate change issues via international agencies. The Guardian International [S.3] featured the project and films in print and online (1st February 2019), the corresponding author Ben Doherty related that the piece was the 3rd most viewed story worldwide upon release. The New York Times featured the project (February 2020) in its Philippines Dispatch [S.3]. The project had further international reach at the Climate Change Commission in August 2020 [S.6]. The 360 films were also played at the British Film Institute (BFI) – Future Film Festival in 2018 and 2019 with over 300 participants viewing the film each day within a 6 metre 360 dome [S.4]. Engagement events were held at the University of the Philippines in 2020 [S.4] which helped with further reach to NGO's (Zoological Society of London (ZSL), Diocese of Tagbilaran, Tzu Chi Foundation).

The research has had international impact in reframing the argument on adaptation to sea-level rise. The films were played as part of keynote speeches at the International Conference on Coastal Engineering ICCE (October 2020 [S.7]) and the ICE Coast, Marine Structures and Breakwaters, Sept 5-7, 2017 [S.8]. The ICCE conference is the most prestigious international coastal engineering conference, held every two years to highlight the leading research in the field. The UK's Institution of Civil Engineers (ICE) Breakwaters conference is the leading coastal engineering conference in the UK, organised every 4 years attracting international experts. The research has therefore been showcased to hundreds of the leading scholars around the world on the subject of coastal adaptation, who are themselves consulted by other practitioners, NGOs and researchers. The research was successful in influencing the views of leading coastal planners and engineers about climate change adaptation, from the idea that communities will gradually retreat to the realization that they will stay in place, and improvise their own 'in situ' adaptation to rising waters.

The RTKT documentary was utilized as a valuable resource at the United Nations Cop 25 Madrid

(2019) as part of the digital programme and in the Oceans Exhibition space [S.5] The films are deemed to be 'one of the important resources of interest to stakeholders across the world consulting the website for information, tools and guidance on issues related to climate change impacts and adaptation for coastal transport infrastructure in the Caribbean and in other Small island Developing States' by Chief, Policy and Legislation Section, Division on Technology and Logistics UNCTAD [S.10].

Regina Asariotis - United Nations Conference on Trade and Development (UNCTAD) further added *'We very much value the extensive collaboration with you and your team on related issues since 2016, issues relating to climate change impacts, adaptation and resilience building for ports and other coastal transport infrastructure in vulnerable developing regions, including your active contribution to our technical assistance project in the Caribbean and to a number of expert meetings, most recently the UNCTAD Expert Meeting on Climate Change Adaptation for Seaports in Support of the 2030 Sustainable Development Agenda, held in October 2020'*.

5. Sources to corroborate the impact

Source 1. Sir Noel Cano Mendana - Municipal Planning and Development Coordinator, Municipal Council of Tubigon, Bohol, Philippines 6329 - https://vimeo.com/520014306
Source 2. Sir Victor Boligao - Fisheries Technology Officer, Municipality of Tubigon, Bohol , Philippines 6329 - https://vimeo.com/520031841
Source 3. The Guardian (published online & in print – 1st Feb 2019)
https://www.theguardian.com/world/2019/feb/01/enduring-the-tide-the-flooded-philippine-islands-that-locals-wont-leave
Ben Doherty, Immigration Correspondent, The Guardian, Australia, +61 (0)431 215 839
ben.doherty@theguardian.com
The New York Times (Philippines Dispatch)
https://www.nytimes.com/2020/02/22/world/asia/philippines-climate-change-batasan-tubigon.html
Source 4. Engagement Events – Feedback to island communities / NGO's / Policy recommendations / Universities http://racingthekingtide.com/engagement/
Source 5. Cop 25 Madrid (2019) – UN Oceans Interagency Initiative - Exhibition space resource whilst also linking via QR code on the digital brochure - (Document Enclosed) Link to UN Oceans Videos
https://seors.unfccc.int/applications/seors/attachments/get_attachment?code=KD40KMVHJ6F87QUTXVICMHTJZ4PJTP2T
Source 6. Climate Change Commission - Philippines - 8th August 2020
https://www.facebook.com/CCCPhl/posts/3387109238018427
https://www.youtube.com/watch?v=JQ9Vr9Yduss&list=PLOWeRyX1mB4wObVtKi6DUhuq2EvEMQ4_E (2hrs: 16mins in)
Source 7. Keynote Speech - Esteban, M., Jamero, L. and Chadwick, C. (2020) "Actual adaptation to sea level rise: learning from subsidence in small islands and coastal megacities", International Conference on Coastal Engineering ICCE, Oct 6-9, 2020, held virtually.
https://doi.org/10.9753/icce.v36v.keynote.8
Source 8. Keynote Speech - Esteban, M., Takagi, H., Jamero, L., Nguyen, D. T., Mikami, T., Onuki, M., Yamamoto, L. and Chadwick, C. (2017) "Adaptation to Sea Level Rise in Cities: Lessons from Present Examples of Land Subsidence", Proc. Of Coasts, Marine Structures and Breakwaters 2013, 5-7 Sept, Liverpool, UK.
https://www.icevirtuallibrary.com/doi/10.1680/cmsb.63174.0029
Source 9. http://racingthekingtide.com/project/the-teacher/ Documentary Film (1:51min - 18K views) https://vimeo.com/244555021 (Chadwick, C., Esteban, M., Jamero, L., - published 31st January 2018)
Source 10. United Nations Conference on Trade and Development (UNCTAD) – Regina Asariotis Testimonial enclosed. Documentary used as a resource on https://sidsport-climateadapt.unctad.org/other-resources/