Defra Futures, Chief Scientific Advisers Office. January 2023

Overview Document.

Summary

The Futures team of the Department for Environment, Food and Rural Affairs (Defra) is responsible for providing strategic foresight in support of the departments strategy and policy development. We use a range of futures methodologies to provide non-mainstream insight and generate novel forms of thinking and evidence. We have identified the strategic need to (1) explore innovations in AI as part of HMGs Artificial Intelligence Strategy[1] and its application in environmental[2] policy foresight generation and (2) provide new forms of evidence (e.g., narrative[3]) to strategic policy priorities (e.g., Land Use Change and Water)[4]. We are therefore seeking an academic partnership to conduct collaborative prototyping and research on the use of Artificial Intelligence[5] to identify and analyse various futural features[6,7] found within unstructured textual data. We are seeking to enter into an initial 9-month partnership with the possibility to extend to output evaluation. As a collaboration, Defra will commit a permanent allocation of scientist and project management staff time. As a partnership, we will be weighing more favourably proposals that will provide a contribution to the project through their own spend, joint-partnering (e.g., with another University or research centre) and/or targeted

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[1] HMG (2021) National Artificial Intelligence Strategy
[2] 'Environmental' is used here are an umbrella term for the full range for policy responsibilities Defra owns.
[3] See for example, Dillon and Craig, 2022
[4] OAK SPLASH, as a foresight science project seeks to support in general with the Environmental Principles, chiefly, the Prevention and Precautionary Principles. Defra (2022) Policy paper, Draft environmental principles policy statement
[5] We use AI as a broad term and take it to include a range of techniques, such as Machine Learning and NLP etc.
[6] 'Future Features' are described in the Output Section below.
[7] OAK SPLASH primarily considers futurity from a phenomenological perspective, e.g., DeRoo (2013) and Strawson in Bayne and Montague, (2011)

use of additional funding sources (e.g., PhD placements). We welcome and encourage creative approaches that will maximise the exposure and accessibility of this research in order to stimulate further policy-focused research and development in AI for environmental foresight more broadly.

Background

'Ash before Oak, you're in for a soak, Oak before Ash, you're in for a splash.' This folklore is grounded in observations of tree flowering and rainfall, and what we should anticipate based on what we see ahead of time: a flowering Ash before Oak, you're in for a wet summer. An future image emerges based on temporal reasoning (Farming Forum, 2019; RHS, 2022 ; Teagasc, 2021)

As Conway (2022) has recently put it, 'images and ideas about the future are constructed in people's minds and generate social, collective realities that are the construct by which our futures are made 'real'. Zittoun and Gillespie (2018) conclude that 'the only access we have to people's meaning-making is through externalization, that is, the part of these semiotic dynamics made perceptible to others'.

One of the most abundant forms of these externalised future imaginaries are found in textual data, whereby text that is 'about' the future, manifests a cognitive thought that is a 'future manifest' (e.g., Strawson in Bayne and Montague, 2011).

Secondly, we can find a special form of narrative - 'Future Narratives (FNs)' in textual data (Bode, 2013). These FNs act to set out choices, set expectations and frame particular futures over others. If these arguments hold, there exists a mass amount of empirical futures data which exceeds the ability of a human analyst to process, but arguably contain stronger associations with 'real futures' than any form of trends analysis or probabilistic assessments.

With OAK SPLASH, we set out to find, surface and analyse these 'real futures' – from the mundane and functional to the aspirational or threatening. Between October 2021 and October 2022, the Futures team, together with academics specialising in futures narratives drawn from the Defra Futures Advisory Group, worked with a commercial AI company to conduct an initial discovery phase of finding these futures within unstructured textual data. This demonstrated some initial feasibility[8] in identifying, extracting and classifying futures within unstructured textual data.

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[8] available upon on request

Intent

The intent of OAK SPLASH is to explore the use of NLP and other associated AI technologies in processing large volumes of open-source textual data to derive useful, policy-relevant evidence of futures and narrative existing in circulation within the 'information domain'.

This project is positioned as a second discovery phase endeavour and we are not seeking to operationalise any findings within the 9-months of the contract. Rather, we seek to test the feasibility, validity, robustness and capacity to derive novel evidence for policymaking.

Therefore, the project will be framed around 3 challenge questions:

In relation to a specific policy-focused area of interest:

Q1. How might we identify and analyse the narrative composition of a given locality?

Q2. How might we identify and analyse what types of future are present in a given locality?

Q3. How might we identify and analyse the contingent elements of certain futures and futures we are being warned of?

Outputs

During the contract period we expect, as a minimum, to produce the following outputs. We'll ask prospective partners to consider how and roughly when these will be achieved as part of their high-level, indicative delivery plan (Delivery Criteria 001).

Output 1. Prototype model outputs against each futural feature (001 – 005) (raw form).

Output 2. 3 x mini-case studies using the model outputs[9] on a live, high priority policy challenge[10], each with a short spotlight report on the results.

Output 3. Prototype data visualisation(s).

Output 4. A short summary report discussing the feasibility, validity, robustness and capacity to derive novel futural and narrative evidence for policymaking through the use of NLP on open-source unstructured textual data (Audience: Government science, research and analyst community and policymakers).

Output 5. First draft of a paper intended for journal publication[11]. (Audience: Research community; AI, futures, environmental policymaking).

Futural Features of Interest in Unstructured Textual Data

001 Futures Classifier

002 Futures Contingency Identifier (FCI)

003 Warnings Extractor

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[9] Dependant on progress, this can be limited to 1-2 of the Futural Feature models. The Defra team will be responsible for developing and preparing the policy test case.

[10] e.g., future narratives of water governance; warnings about climate adaption risks; future contingencies identified for land use change etc.

[11] This would be a joint responsibility with the Defra team

004 Archetypal Narratives (AN) Designator

005 Narratives Generator

Details[12]

Feature	Description
001 Futures Classifier	Classifies sentences that are about the futures as one of 3 future typologies – OPEN, CLOSED or VUCA
002 Futures Contingency Identifier (FCI)	Identifies the contingent element of VUCA classified Futures, at sentence level, and it's corresponding futures content.
003 Warning Extractor	Extracts and assesses warnings within a given article or unstructured text
004 Archetypal Narratives (AN) Designator	Designates a given article or unstructured text one of five ANs: (1) Overcoming the Monster; (2) Quest; (3) Tragedy; (4) Revenge and (5) Rebirth and Transformation.[13]
005 Narratives Generator	Generates a human-level single narrative for a given article or unstructured text[14] [Note. Custom metrics will be developed with each feature].

Capability and Process

006   Data Analysis and Visualisation (including geolocation).

007   Data Review and Management

008   Ethics Review and Data Protection Impact Assessment (DPIA)

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[12] Whilst the details should be considered indicative rather than definitive, we are expecting experimentation on each Futural Features identified.
[13] See Annex A
[14] We need to explore issues of clustering narratives to achieve aggregated narratives at difference scale.

Defra Partnership Contribution

Type	Description	
Staff	Science and Engineering Fast Streamer (SEF). Product development and project management and coordination (Defra)	1 x FTE
Staff	Head of Futures, Programme Director (Defra)	0.4 FTE
Staff	Senior Analyst (Defra)	0.1 FTE
Staff	Internal Data Integration Advisor (Defra)	0.1 FTE
Staff	Futures Lead, (Environment Agency) liaison	0.1 FTE
Academic	Defra Futures Advisory Group members specialising in narratology, speculative fiction, social futures and linguists.	3 x 0.1 FTE
Resource	Access to large (20-50 people) capacity meetings rooms in Bristol and London with hybrid capability	
Resource	Facilitated access and opportunity to engage a wider HMG community	
Resource	All 'project team members' (x 7), plus additional Defra Futures Community of Practice members will be available to support model training (e.g., Data Tagging)	

Evaluation Criteria[15]

	Essential Criteria: Technical		Desirable
T001	Demonstrable competency in developing, training and proving the robustness of Natural Language Process (NLP) models[16]	**T001D**	Publicised current research in relevant areas
T002	Ability to apply[17] Natural Language Processing (NLP) to a range of different unstructured textual data forms (e.g., Social Media, blogs, Journals, literature, technical reports, science fiction etc.)[18]	**T002D**	Ability to apply Natural Language Processing (NLP) to at least one non-English language[19]
T003	Have (or be able to access) a specialist in Media Information Analysis (e.g., reach/engagement metrics, emerging social media environments, media coverage, socio-political media data, audience segmentation, media ownership, demographics etc.)	**T003D**	Access to foreign linguists' for deeper studies on non-English language testing (esp. Russian, Chinese, Arabic or Spanish).
T004	Knowledge of, access to[20] and ability to configure appropriate datasets both for training and live testing[21].		
T005	Ability to host data in a suitable environment		

	Essential Criteria: Delivery		Desirable
D001	Produce a high-level, indicative delivery plan that describes how the each of the futural features, capabilities and processes will be attended to.[22]	**D001D**	Has established links with other relevant programmes, projects and institutions broadly related to data innovations in environmental fields

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[15] The Evaluation Criteria should be read alongside the HMG (2020) Guidelines for AI procurement – GOV.UK (www.gov.uk)

[16] Herein, NLP includes any other associated techniques (e.g., topic modelling) that could be used.

[17] By 'apply', you should infer 'experiment with'. We are seeking to test feasibility and viability of different forms of unstructured textual data.

[18] Available on request – includes a continually growing and refining dataset of ~2000 pre-identified sources, organised in Source Groups. This does not contain raw textual data but does indicate where we would seek to direct scrapping from.

[19] Primarily for comparative analysis (e.g., does an NLP Futures Classifier trained on English data provide reliable results on Russian texts?)

[20] We anticipate this may include purchasing data and expect proposal to budget according for this provision.

[21] Ibid

[22] We anticipate an initial workshop to establish a joint way of working, timings and output schedule within the first month

D002   Produce a high-level, indicative costed breakdown of named personnel to be assigned to the project, including an appointed research director.

D003   Demonstrate (and where necessary develop) appropriate data governance mechanisms

D002D   Have established means to ensure (or be willing to support the development of) effective knowledge sharing.

D004   Commitment to open[23], transparent and explainable protocols with a clear focus on critically engaging with and addressing issues of algorithmic and data bias

D005   Appropriately skilled personnel identified to support the completion of a Data Protection Impact Assessment (DPIA)[24] with the Defra DPO and core team.

D006   Set up and conduct ethics reviews with appropriately skilled personnel and processes.

D007   Able to work in an agile manner, focusing on releasing outputs early and often to support iteration.[25]

D008   Commitment to interdisciplinary, critical investigation of the NLP methodology, technical tools and processes used[26]

D009   Delivery risks identified, assessed and managed

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[23] Here referring to Open Standards and towards publishing of theory, methods and results.
[24] ICO, Data Protection Impact Assessment
[25] To best ensure this collaboration can be opportunistic in its support to live policy making, we would aim to work together to agree 'Output Iteration Cycles' (OIC) whereby we can gauge when we can anticipate output.
[26] e.g., Halford et al (2018); Halford and Savage (2017); Tinati et al (2014).

Annex A: Archetypal Narratives Descriptions

In seeking to develop novel forms of foresight evidence to be used in policymaking, the Defra Futures Team has previous (and manually) explored narrative assessment using Archetypal Narratives (ANs) to anticipate changes in our policy environment based on the trajectory of the narrative arch. This annex provide a high-level description of the 5 ANs we use.

OVERCOMING THE MONSTER

In protecting the status quo threaten by an "evil monster", heroic leadership emboldens collective action, rallies resources and unites to defeat the enemy. But monsters typically re-emerge, taking slightly differing forms each time. The crowd strikes out. Proxy targets are sought. Fighting a faceless monster is hard so fictional ones are built up. The drive for normalcy, a return to how things where and a fatigue of conflict ensue before too long. Mythical discourse affects political practice by imbuing language with power, shaping what people consider to be legitimate, and driving the determination to act.[27]

TRAGEDY

A tragic narrative can connect us to our small decisions and their much larger effects on things we really care about value. Yet viewing a foreboding apocalypse tragically suggests that human agency is limited towards a catastrophic end which is clear and unstoppable, characterized by "resignation" to a foretold ending. People lose faith, fight for survival but slowly accept the insurmountability of their situation.[28]

QUEST

A group set out towards a future goal, to acquire something seemingly unobtainable, something that will change their, and others, lives for the *better*. Quests have strong visions or North Stars. They also have troubles, fractions and disillusionment.

REVENGE

Revenge is an attractive narrative that quenches deep desires, yet every action introduced to serve a particular function always has other consequences that were not *imagined*. In seeking the 'high' of revenge, groups often fail to anticipate disastrous personal consequences, but it also works as a strong deterrent, without necessarily having to follow through with threats.

'Individual-level mechanisms of radicalization include anger and revenge for harm to self or loved ones (*personal grievance*); outrage for injustice to a larger group or cause the individual cares about (*group grievance*); participation in progressively more radical acts that culminate in terrorism (*slippery slope*); helping a friend or loved one already radicalized (*love*); risk and power seeking, especially by young men (*status seeking*); and escape from personal problems

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[27] Esch (2010) Legitimizing the "War on Terror": Political Myth in Official-Level Rhetoric; Choy (2018) Your Leadership Storytelling Toolkit Needs An 'Overcoming The Monster' Story; Krotoski (2021) Your brain is temporal soup: How past narratives trap our future thoughts ; Litt (2010) The 80s: the best of times, the worst of times
[28] Foust and Murphy (2009) Revealing and Reframing Apocalyptic Tragedy in Global Warming Discourse; Pihkala (2018) Eco-anxiety, Tragedy, And Hope: Psychological And Spiritual Dimensions Of Climate Change

(*escape*). Finally, *unfreezing* is a loss of social connection that opens an individual to new people and new ideas; it is a multiplier of the power of the other mechanisms.'[29]

REBIRTH AND TRANSFORMATION

Triggered by some form of profound, irrecoverable trauma or disruption to the ego, a sudden breakdown overwhelms any capacity for resistance. Final resignation leads to reincarnation; a temporary stillness, a new form of living, detached from the previous life but cognisant of it – the incumbent structures disbanded and the pursue of new, often unknown ends ensues.[30]

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[29] McDermott et al (2017) Blunt Not the Heart, Enrage It" The Psychology of Revenge and Deterrence; Hatemi and McDermott (2020) Revenge is a dish best served nuclear. US deterrence depends on it.; Crockett et al, (2014) The Value of Vengeance and the Demand for Deterrence; McCauley and Moskalenko (2017) Understanding Political Radicalization: The Two-Pyramids Model

[30] Jung & Hull (1969). Four Archetypes; Concerning rebirth; Stirling (2015). From controlling 'the transition' to culturing plural radical progress. The politics of green transformations; Temper et al (2018) A perspective on radical transformations to sustainability: resistances, movements and alternatives; Shildrick (2019) (Micro)chimerism, Immunity and Temporality: Rethinking the Ecology of Life and Death