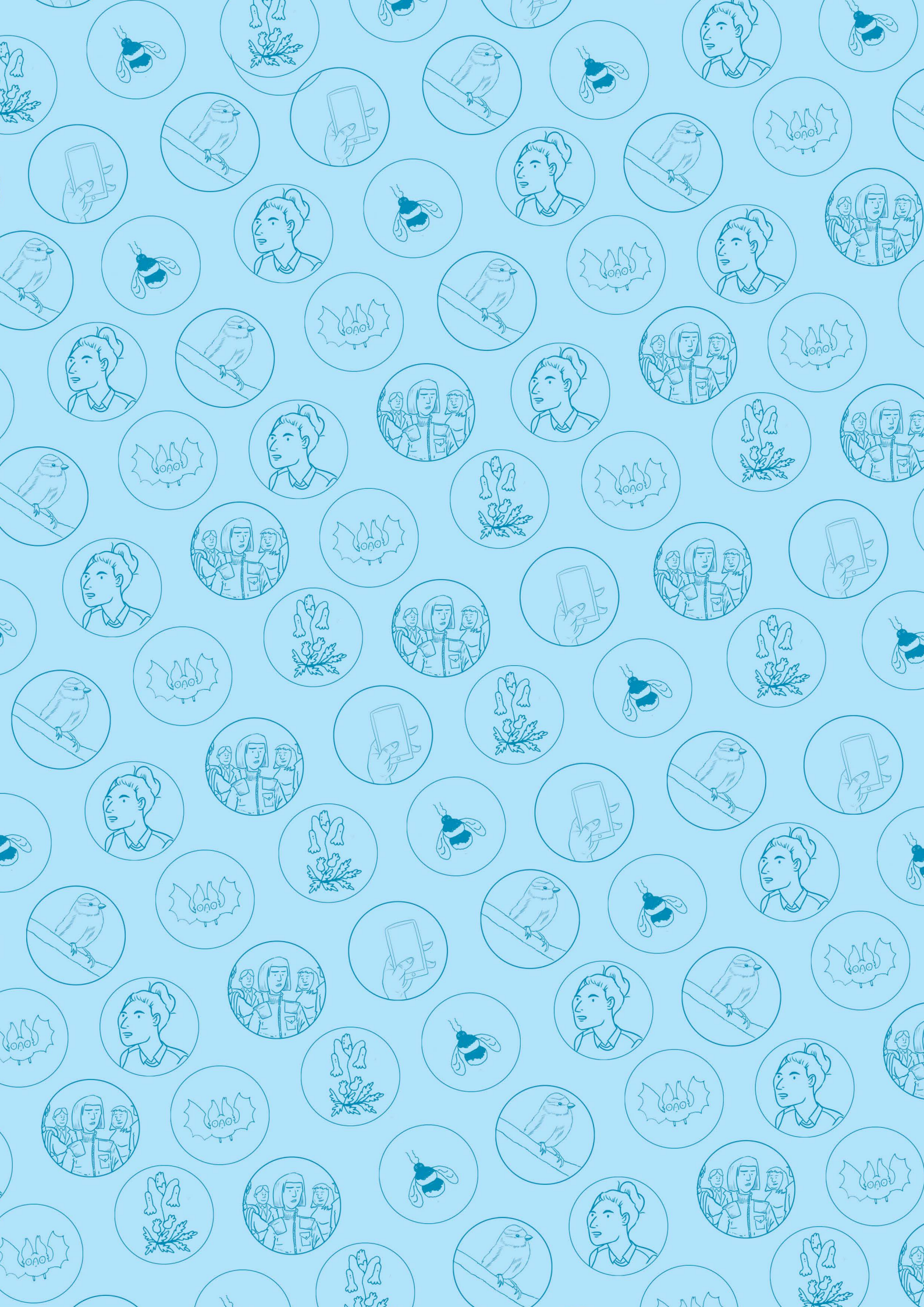




CROWD POWER

THE **COBWEB** GUIDE TO CITIZEN SCIENCE





CROWD POWER
The COBWEB guide to citizen science

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First printing 2016
Published in Glasgow by (BHP Comics) Black Hearted Press Ltd.

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Made in Scotland. Printed in Great Britain by Bell & Bain Ltd.

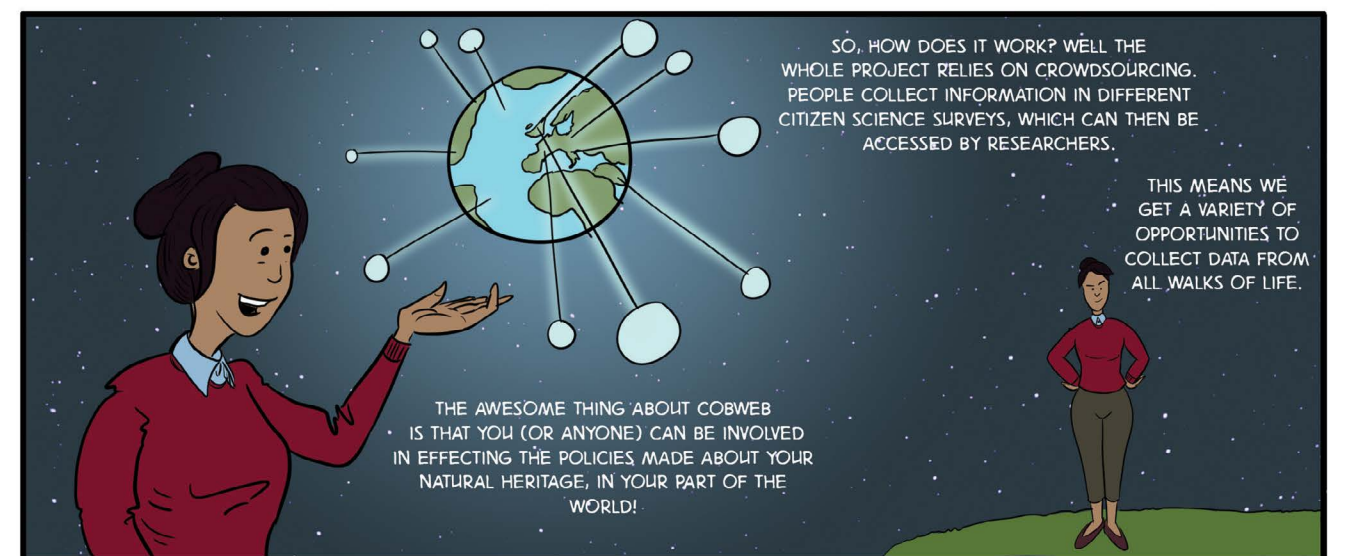
ISBN: 978-1-910775-07-3
A CIP catalogue reference for this book is available from the British Library

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**CROWD
POWER**

THE **COBWEB** GUIDE TO CITIZEN SCIENCE

1 WHAT IS COBWEB?



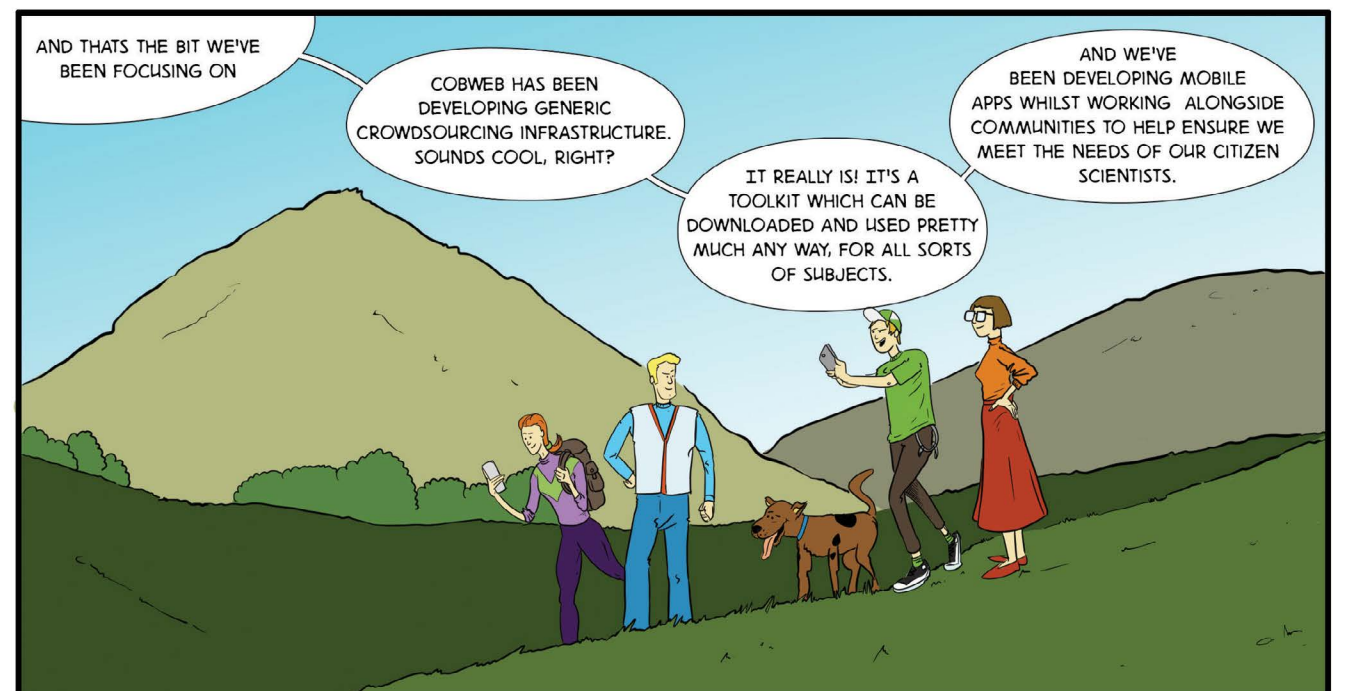
Acknowledgements

The COBWEB: Citizen Observatory Web project would like to thank the European Union, the European Commission and the UNESCO Man and the Biosphere Programme for their support throughout the project. We would also like to thank the European Citizen Science Association which we are proud to be part of.

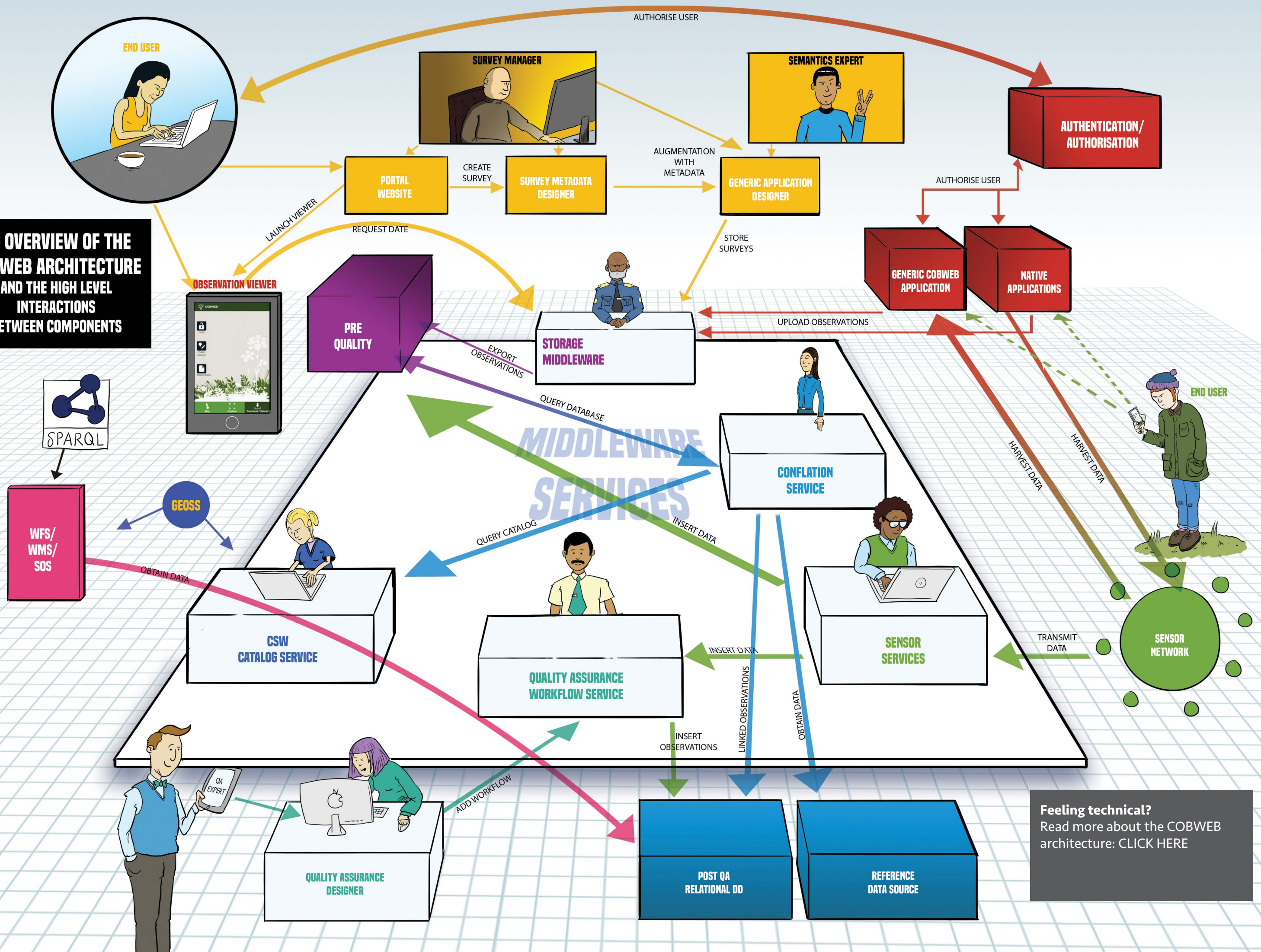
We would like to acknowledge and thank all of the project partners within the COBWEB Consortium. We would also like to thank friends and colleagues who have supported and fed ideas into COBWEB from across Europe, and across the world.

We would like to thank our co-design project partners in Wales: Cardigan Bay Marine Wildlife Centre, Coetiroedd Dyfi Woodlands, Penparcau Community Forum, RSPB (the Royal Society for the Protection of Birds), Snowdonia National Park Authority, The Outward Bound Trust, and Ysgol Bro Hyddgen.

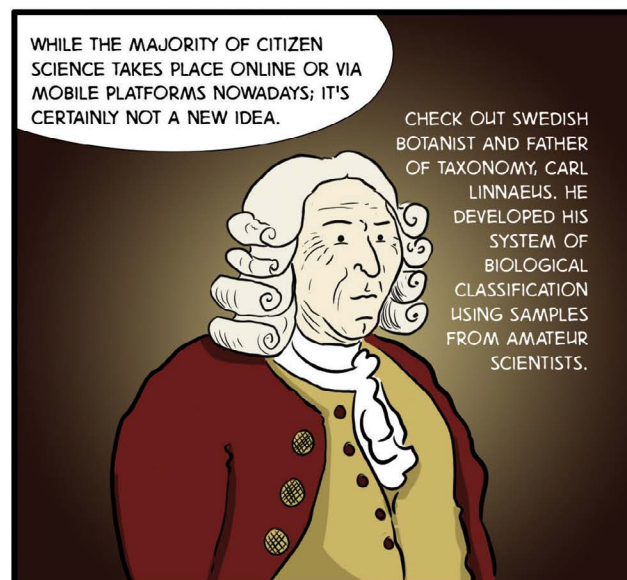
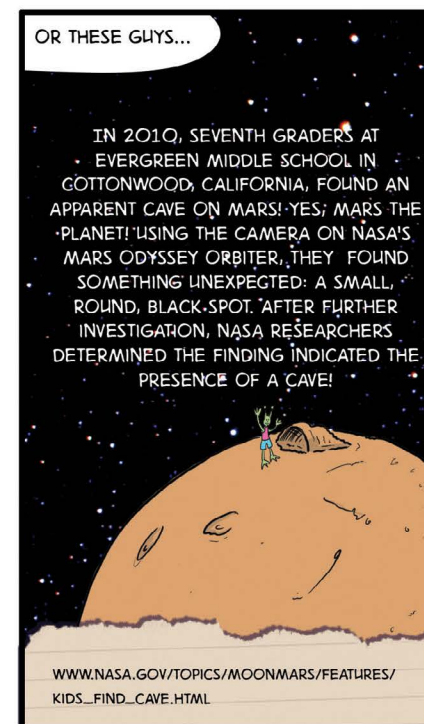
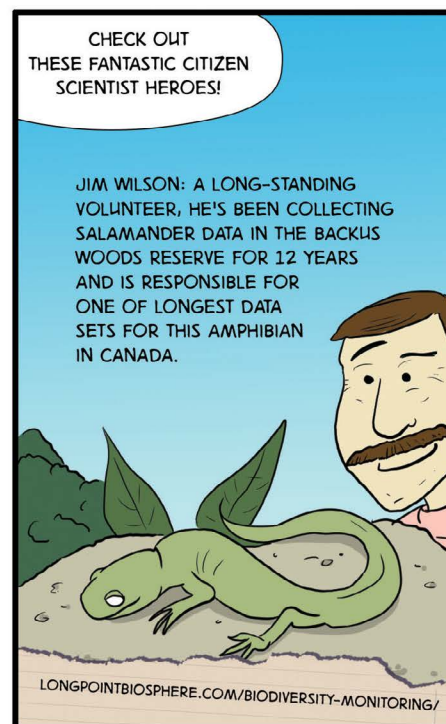
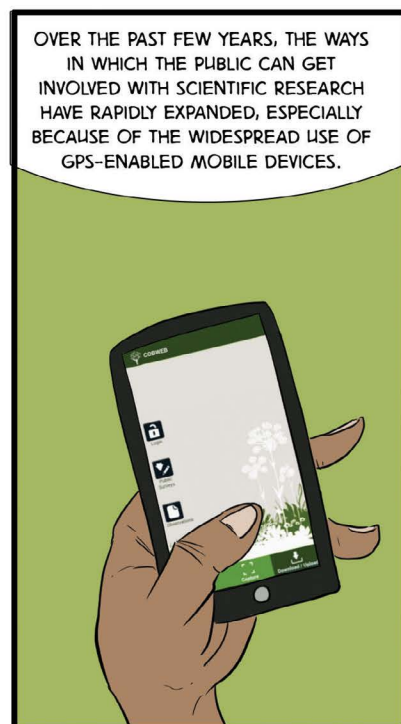
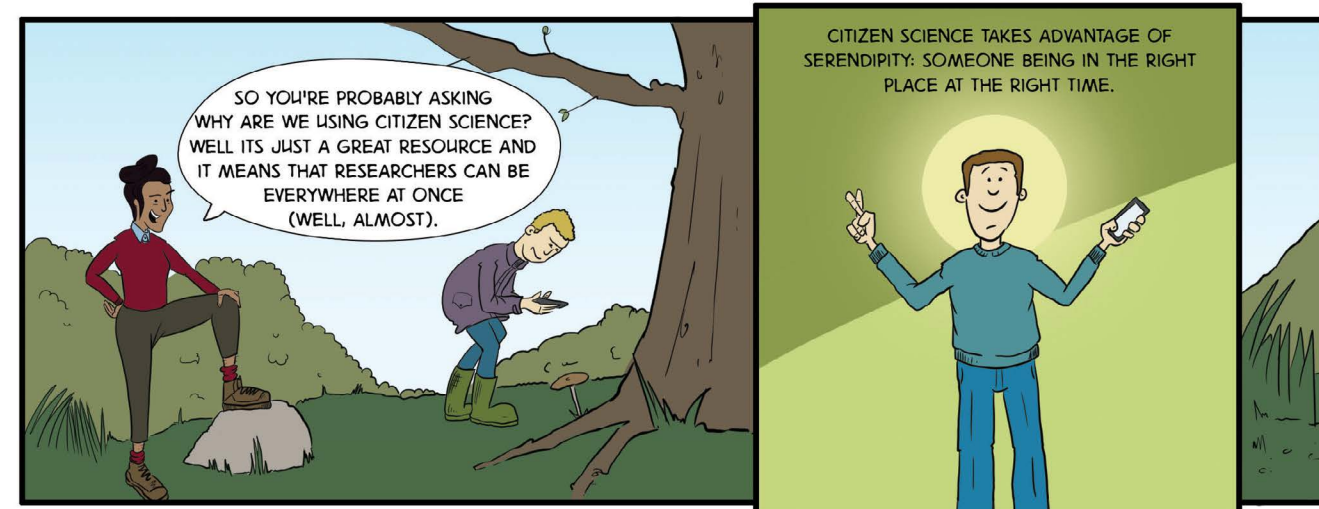
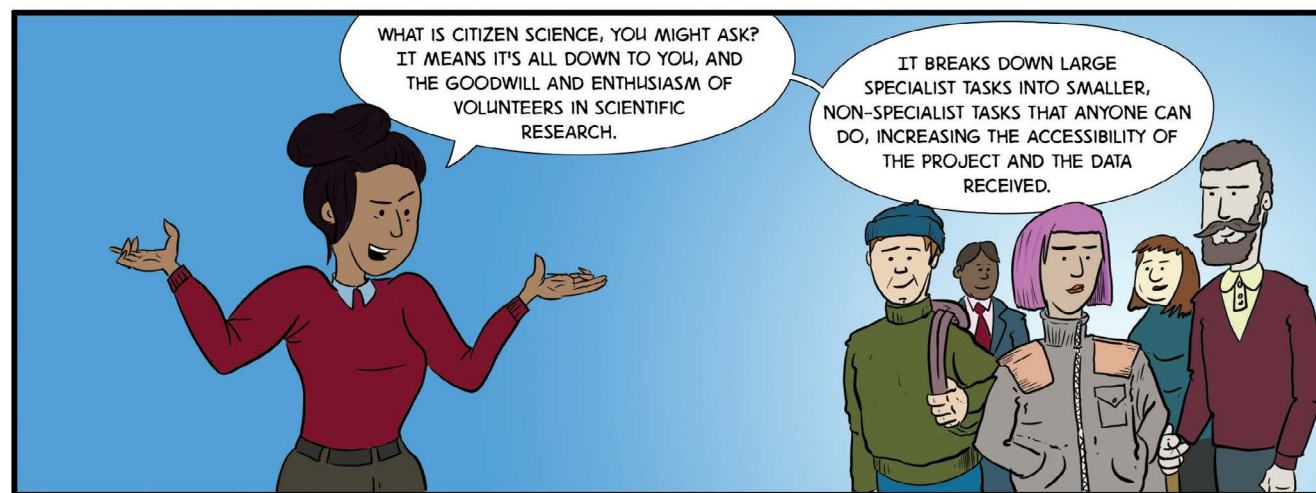
Most of all we would like to thank the people who have made our work possible: the brilliant citizens, schools, visiting volunteers, community groups, and managing bodies in the COBWEB test and demonstrator sites: the Dyfi Biosphere Reserve in Mid-Wales; the Gorge of Samaria and Mount Olympus Biosphere Reserve and the Natura 2000 sites of Mesologgi Lagoon, Mount Parionas, and Mount Ziria in Greece; Nationalpark Niedersächsisches Wattenmeer in Wilhelmshaven, and in the Oberlausitzer Heide und Teichlandschaft in Saxony, Germany.

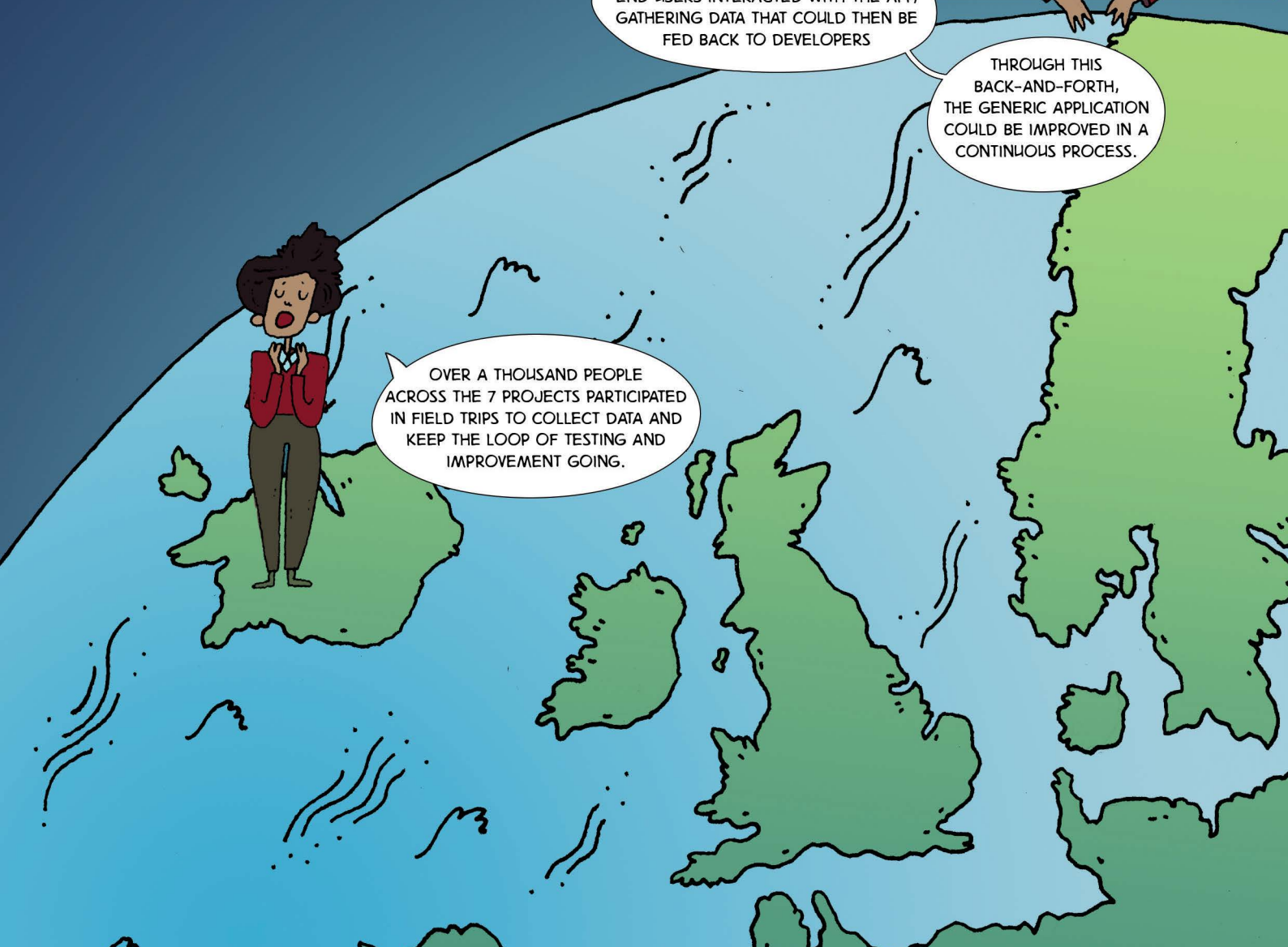
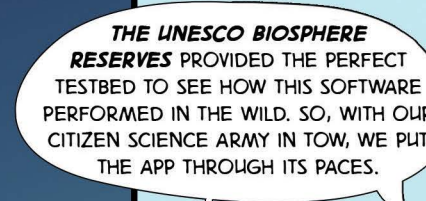
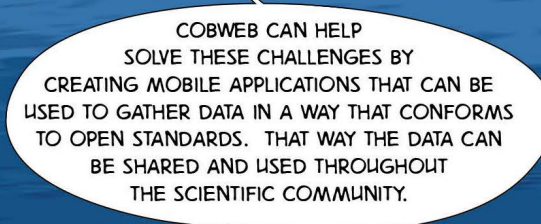


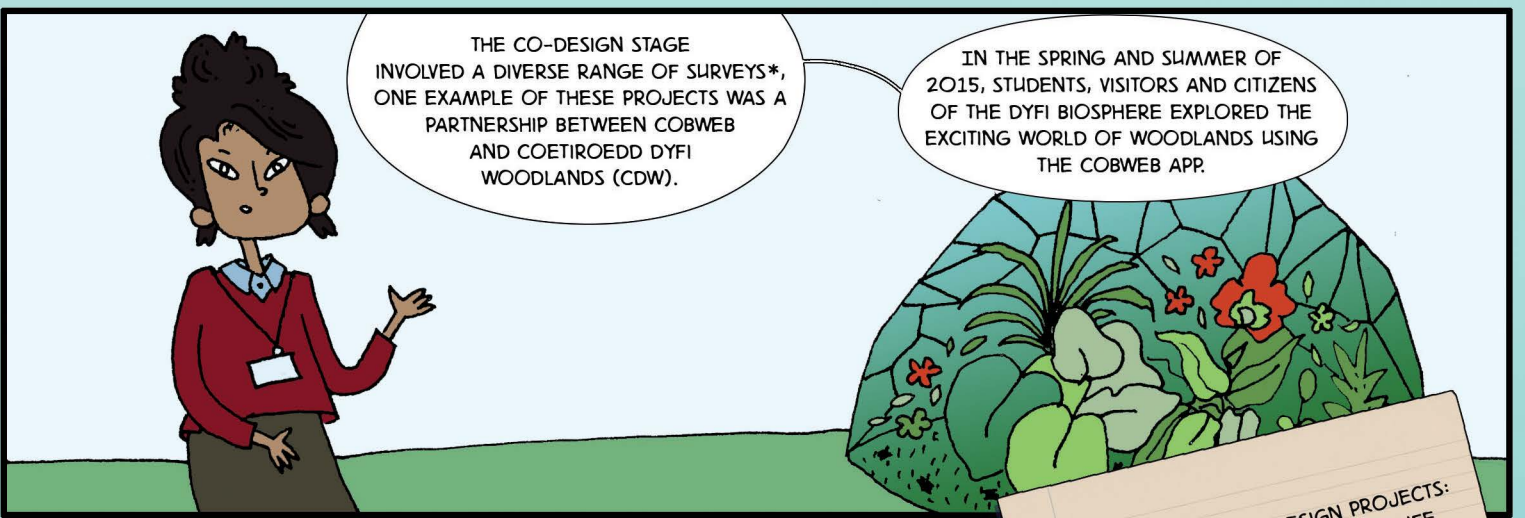
**AN OVERVIEW OF THE
COBWEB ARCHITECTURE
AND THE HIGH LEVEL
INTERACTIONS
BETWEEN COMPONENTS**



Feeling technical?
Read more about the COBWEB
architecture: [CLICK HERE](#)



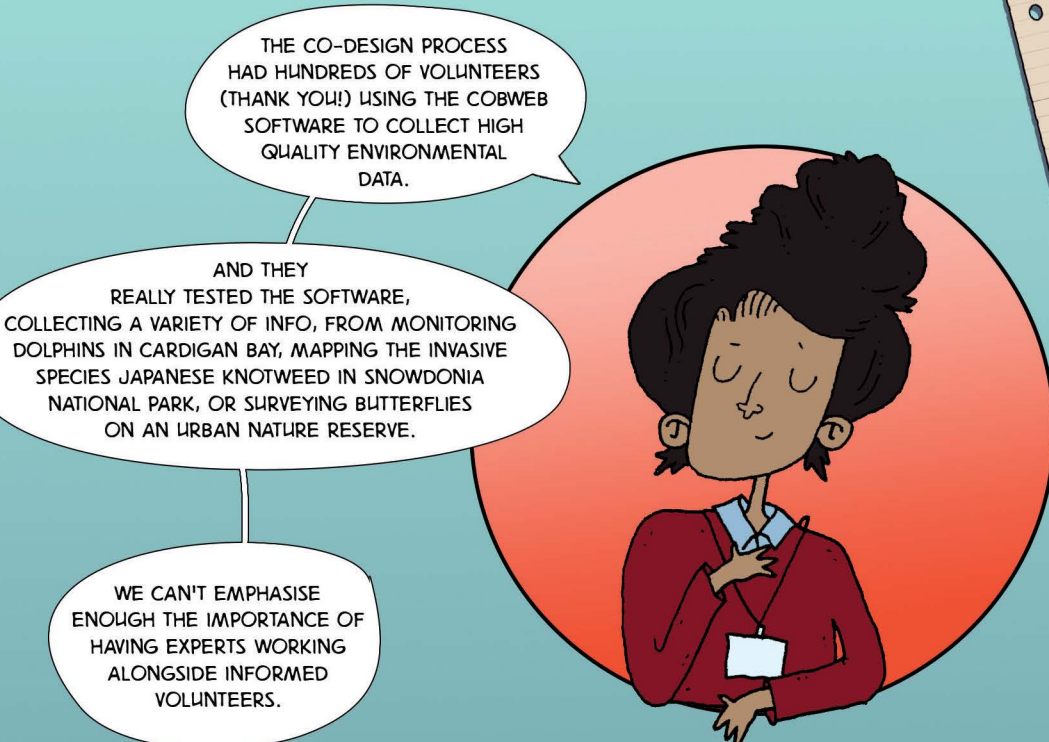




THE CO-DESIGN STAGE INVOLVED A DIVERSE RANGE OF SURVEYS*, ONE EXAMPLE OF THESE PROJECTS WAS A PARTNERSHIP BETWEEN COBWEB AND COETIROEDD DYFI WOODLANDS (CDW).

IN THE SPRING AND SUMMER OF 2015, STUDENTS, VISITORS AND CITIZENS OF THE DYFI BIOSPHERE EXPLORED THE EXCITING WORLD OF WOODLANDS USING THE COBWEB APP.

*HERES A LIST OF CO-DESIGN PROJECTS:
CARDIGAN BAY MARINE WILDLIFE CENTRE
COETIROEDD DYFI WOODLANDS
PENPARCAU COMMUNITY FORUM
RSPB (ROYAL SOCIETY FOR THE PROTECTION OF BIRDS)
SNOWDONIA NATIONAL PARK AUTHORITY
THE OUTWARD BOUND TRUST
YSGOL BRO HYDDGEN



THE CO-DESIGN PROCESS HAD HUNDREDS OF VOLUNTEERS (THANK YOU!!) USING THE COBWEB SOFTWARE TO COLLECT HIGH QUALITY ENVIRONMENTAL DATA.

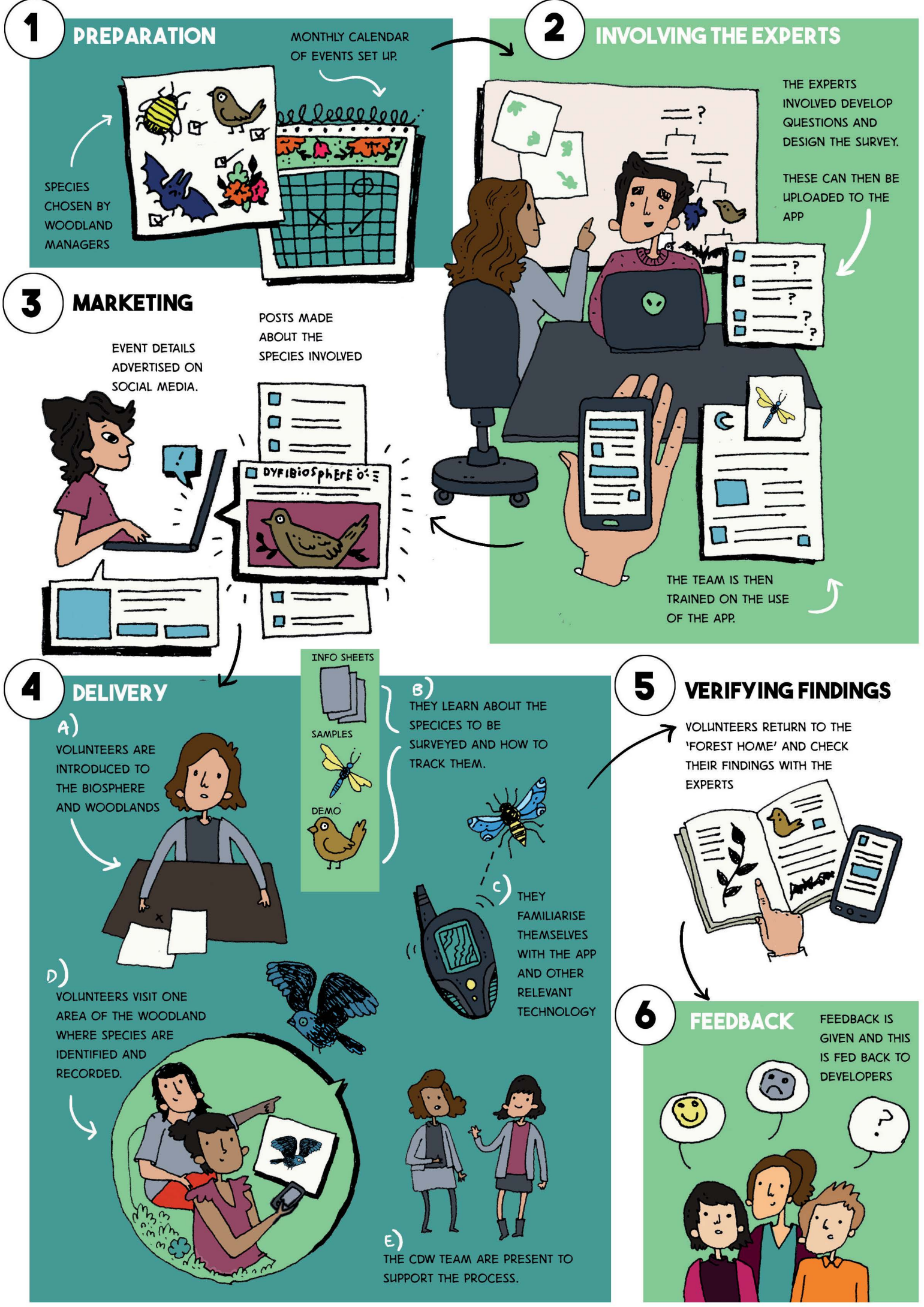
AND THEY REALLY TESTED THE SOFTWARE, COLLECTING A VARIETY OF INFO, FROM MONITORING DOLPHINS IN CARDIGAN BAY, MAPPING THE INVASIVE SPECIES JAPANESE KNOTWEED IN SNOWDONIA NATIONAL PARK, OR SURVEYING BUTTERFLIES ON AN URBAN NATURE RESERVE.

WE CAN'T EMPHASISE ENOUGH THE IMPORTANCE OF HAVING EXPERTS WORKING ALONGSIDE INFORMED VOLUNTEERS.



EACH OF OUR EVENTS WAS FACILITATED BY A DELIVERY TEAM, INVOLVING A LEADER, ASSISTANT AND EXPERT PLUS OUR FANTASTIC CITIZENS, SO THEY COULD POTTER OFF AND DO THEIR OWN THING, KNOWING THAT OUR EXPERTS WERE ON HAND TO SUPPORT IF NEEDED.

EACH EVENT WAS A REALLY FUN DAY OUT FOR EVERYONE INVOLVED. WE GOT TO TEST COBWEB AS A RECORDING TOOL AND THE VOLUNTEERS GOT TO EXPLORE AND ENGAGE WITH THEIR LOCAL WOODLAND.



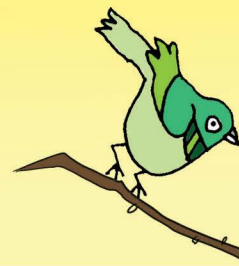
MONTH 1



THE FIRST EVENT WAS A **BIOBLITZ SURVEY**, AN INTENSIVE FIELD STUDY WHERE SCIENTISTS AND VOLUNTEERS WORK CONTINUOUSLY IN AN ATTEMPT TO RECORD ALL SPECIES WITHIN A DESIGNATED AREA.
(NOT ASKING FOR A LOT HERE!)



THE APP INCLUDED A 'DECISION TREE' FUNCTION WHICH USED A SERIES OF QUESTIONS TO HELP VOLUNTEERS IDENTIFY SIX BIRD SPECIES.



HOWEVER THIS MEANT CONFIDENT PARTICIPANTS THAT IDENTIFIED ADDITIONAL BIRD SPECIES COULDN'T RECORD THIS INFORMATION.



SO DEVELOPING WHILE TESTING THE TEXT-BOX, 'OTHER' WAS BUILT INTO THE APP TO MAKE THIS POSSIBLE.

THE 'YES' OR 'NO' ANSWERS IN THE DECISION TREE WERE REWRITTEN AS STATEMENTS (SO THE ANSWERS MAKE MORE SENSE WHEN VERIFYING THESE LATER)



MONTH 2



AT THIS STAGE WE TOOK THE TEMPLATE WE STARTED WITH AND REDESIGNED THE SURVEY QUESTIONS TO RECORD BIRCH TREE POPULATIONS AND THE PRESENCE OF BIRCH POLYPORES.



THE PRESENCE WAS INDICATED BY A SIMPLE 'YES' / 'NO' ANSWER AND LANGUAGE WAS SIMPLIFIED TO MAKE THE SURVEY MORE ACCESSIBLE.

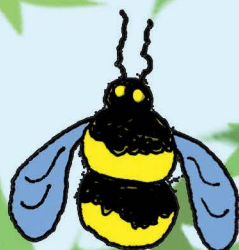


ADDITIONAL TECH WAS ADDED INTO THE MIX, SO IN ONE SURVEY BAT DETECTORS WERE INCORPORATED SO CITIZENS COULD USE FREQUENCIES TO IDENTIFY BAT SPECIES... NEAT.

MONTH 3



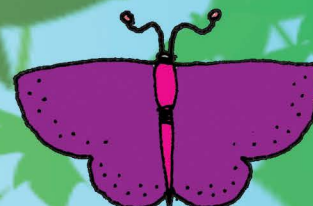
DURING MONTH 3, A BUTTERFLY AND BEE SURVEY LOOKED AT THE RELATION OF POLLINATORS TO GROUND FLORA. YES.. WE JOKED ABOUT THE BIRDS AND THE BEES..



A DROP-DOWN MENU WAS INCLUDED FOR BOTH FLORA AND POLLINATORS.



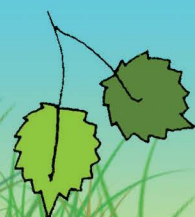
PARTICIPANTS ALSO NOTED IF THE POLLINATORS WERE RESTING, FLYING OR FEEDING.



AND AT THIS POINT THE ABILITY TO CAPTURE MULTIPLE IMAGES WAS BUILT INTO THE COBWEB APP, SO THAT THESE COULD BE USED LATER TO CONFIRM SPECIES WHEN PARTICIPANTS WERE UNCERTAIN, WHICH IS JUST A GAME CHANGER IN MAKING SURE WE HAVE THE CORRECT INFO.



MONTH 4



WE THEN CHANGED STYLE OF QUESTIONING AND INCLUDED THE SCIENTIFIC NAMES FOR SPECIES FOR THE FERN SURVEY.



WE ALSO CREATED AN ADDITIONAL APP, GRID REFERENCE, THIS WAS A GREAT BOLT-ON TOOL.



AND DIVIDED THE WOODLAND INTO SPECIFIC ZONES TO HELP CONFIRM LOCATIONS.



BY THIS STAGE WE ALSO REALISED THE SURVEY NEEDED A COPY AND PASTE OPTION TO HELP WITH REPETITIVE QUESTIONING STYLES, NOT THE MOST EXCITING DEVELOPMENT, BUT A TIME-SAVING ONE FOR THE TEAM INVOLVED.



ELSEWHERE IN THE DYFI BIOSPHERE, COBWEB WORKED WITH THE CARDIGAN BAY MARINE WILDLIFE CENTRE. HERE, THEY DEVELOPED THE APP TO RECORD SIGHTINGS OF MARINE MEGAFaUNA FROM BOTH LAND AND SEA.

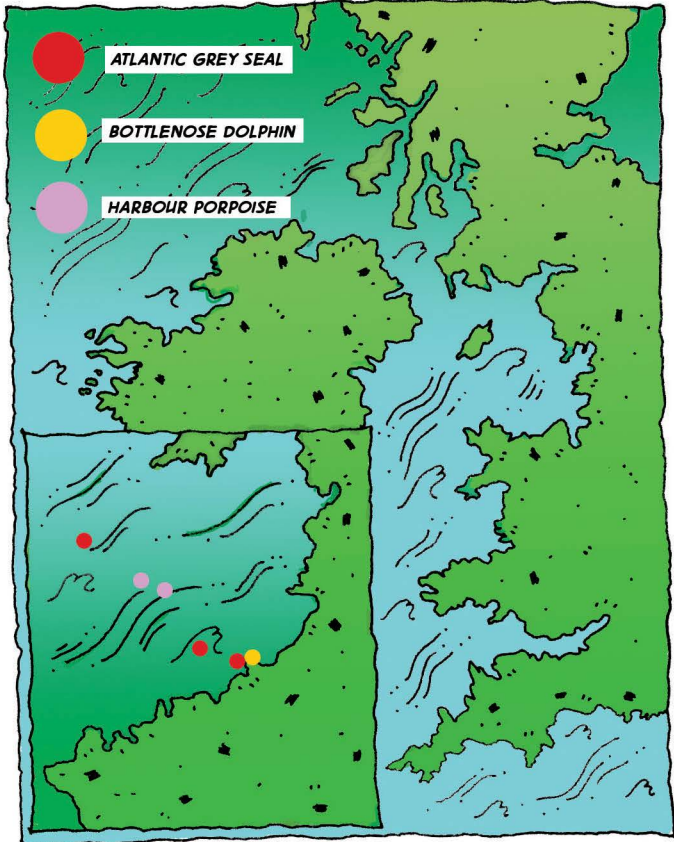
AND EVEN WITH THE WELSH WEATHER STRUGGLES, THE PROJECT SUCCESSFULLY COLLECTED USEFUL DATA FROM TWENTY TESTING SESSIONS AND USED THE APP TO RECORD SIGHTINGS OF BOTTLENOSE DOLPHINS, ATLANTIC GREY SEALS AND HARBOUR PORPOISES.

CHECK OUT THIS LOVELY TABLE OF DATA

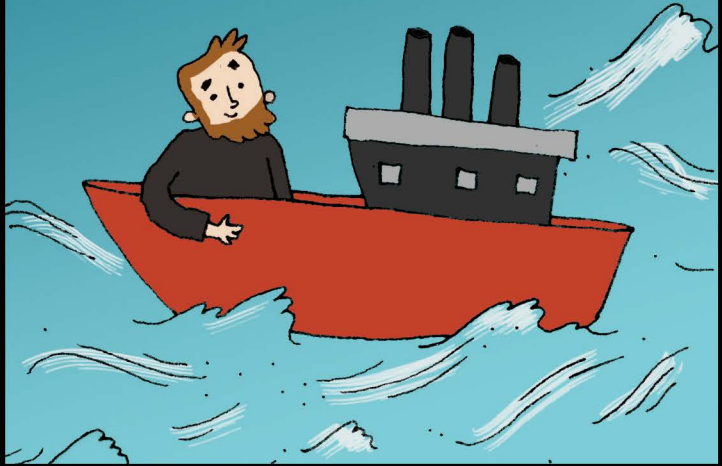
SPECIES	MARINE SIGHTING (PUBLIC)				CBMWC SIGHTINGS			
	MAY	JUNE	JULY	AUGUST	MAY	JUNE	JULY	AUGUST
BOTTLENOSE DOLPHIN	7	10	-	-	6	13	-	10
ATLANTIC GREY SEAL	-	5	-	-	2	14	-	6
HARBOUR PORPOISE	-	3	-	-	1	4	-	1
OTHER	-	-	-	-	-	1	-	1



SOMETIMES THE GPS FAILED, THROWING OFF THE LOCATIONS OF THE SIGHTINGS SO THAT SOME WERE FAR TOO INLAND.



THE TEAMS ALSO RECORDED THEIR LOCATION REGULARLY SO THAT THE PATH TAKEN BY THE RESEARCH BOATS COULD BE TRACED LATER ON. VOLUNTEERS FOUND THIS TRICKY AND TIME- CONSUMING THOUGH, MAKING IT CLEAR THAT BUILDING A TRACKING ELEMENT INTO THE APP WOULD BE A FAR BETTER SOLUTION.



"THE SURVEY MIGHT HAVE BITTEN OFF A BIT MORE THAN IT COULD CHEW IN ATTEMPTING A BIOBLITZ WITH THE APP AT SUCH AN EARLY STAGE"



"THE PROJECT WAS NOT ALWAYS SMOOTH SAILING, WITH SOME MALFUNCTIONS IN THE COBWEB APP BEING A PARTICULAR CHALLENGE: FROZEN SCREENS, GPS ISSUES..."



"WHEN IT WORKED, IT WAS GREAT AND EASY TO USE: WHEN IT DIDN'T WORK, IT WAS SO INFURIATING"



"TECHNICAL DIFFICULTIES DIDN'T STOP ME FROM ENJOYING AND ENGAGING WITH THE EVENTS. I REALLY LIKED THE FEEL OF THE EVENTS, AND FOR ME THE SURVEYS BECAME A 'DAY OUT'. I UNDERSTOOD THAT THESE PROBLEMS WERE PART OF THE GROWING PAINS OF THE APP."



"I'M NOT THE BIGGEST FAN OF SMARTPHONES BUT THE APP WAS REALLY EASY TO USE!"



"WITHOUT EVIDENCE FROM THE COBWEB PROJECT, WE WOULDN'T HAVE GOT THE EXTERNAL FUNDING TO DEAL WITH OUR JAPANESE KNOTWEED PROBLEM!"



"GETTING THE OPPORTUNITY TO BRING A DIVERSE GROUP OF PEOPLE TOGETHER TO TAKE PART IN A LARGE PROJECT WAS A REAL POSITIVE. IT ALSO HAD A STRONG IMPACT ON UNDERSTANDING CITIZEN SCIENCE AND THE ABILITY THEY HAVE TO SUPPORT THEIR LOCAL WOODLAND."



"IT'S VERY GOOD FOR EXPLORING AND DISCOVERING NATURE"



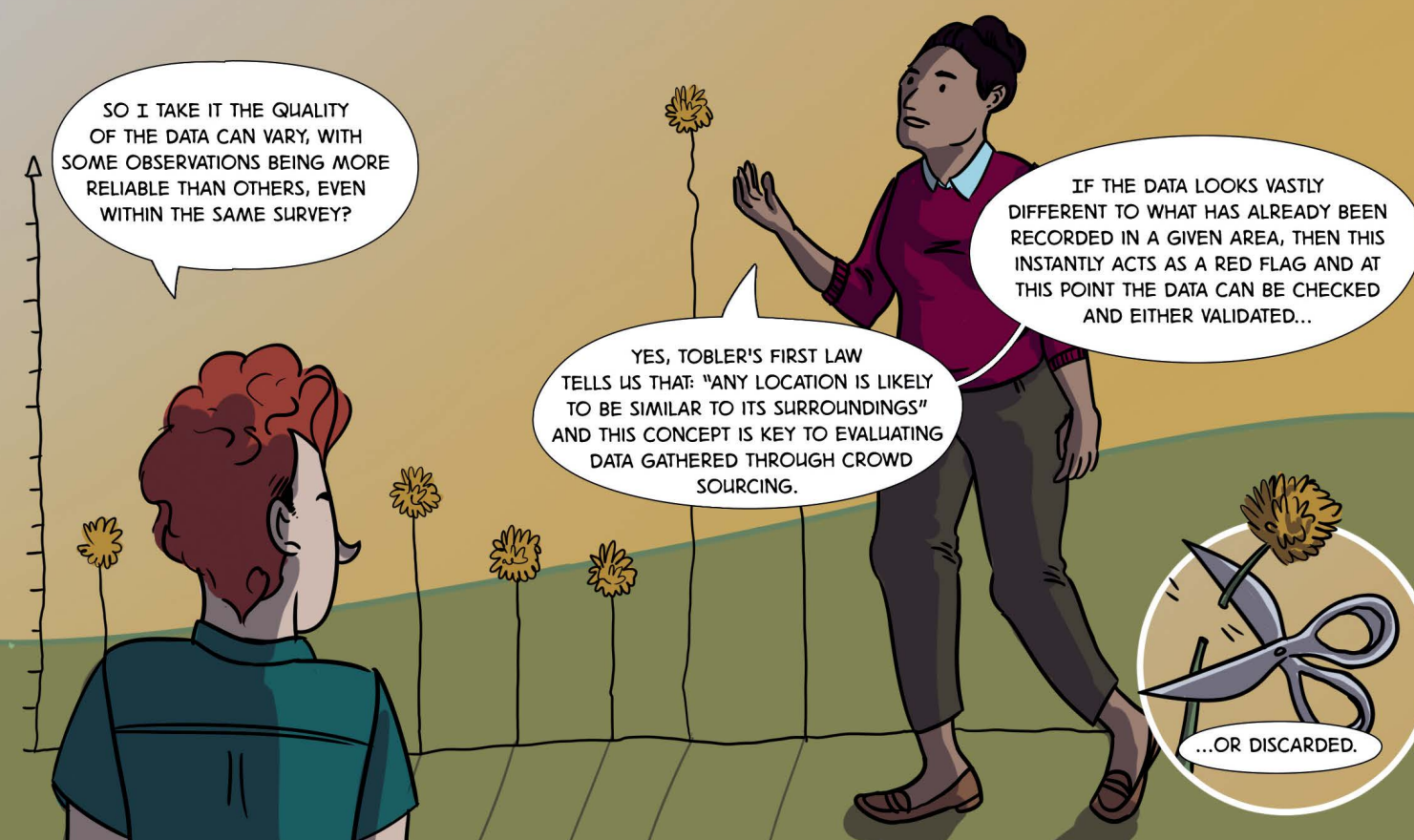
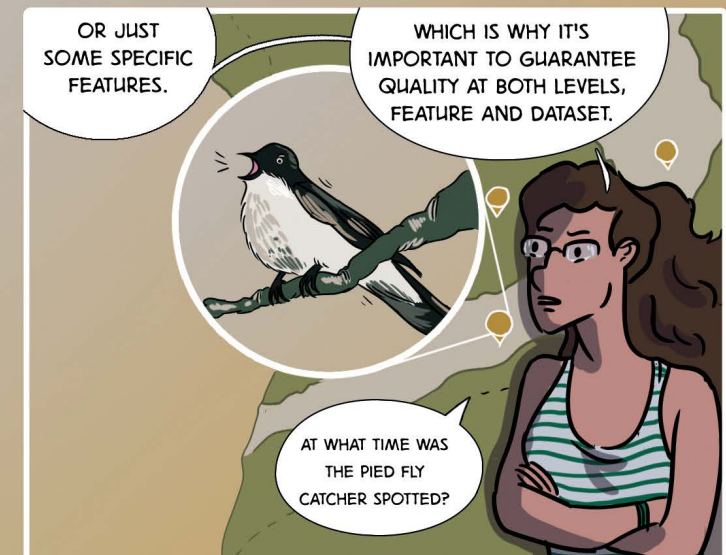
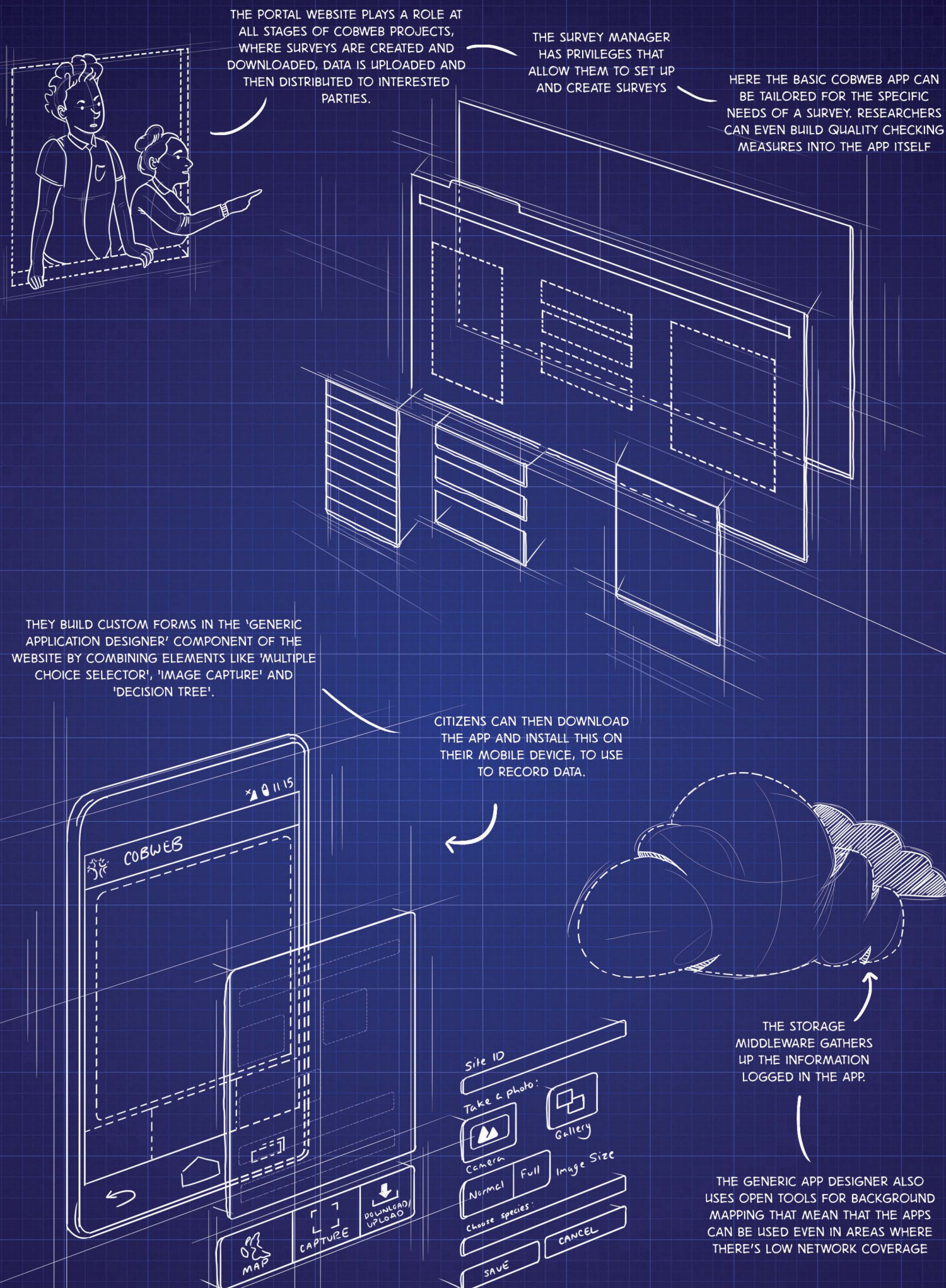
"..EVERY TEACHER HAS BEEN REALLY IMPRESSED BY COBWEB AND KEEPS TELLING ME ITS A GREAT WAY OF PROMOTING SUSTAINABILITY AND CONSERVATION OF ANY ENVIRONMENT."





3 COBWEB: UNDER THE BONNET







SO OUR CRITERIA FOR MEASURING THE QUALITY OF DATA IS GATHERED FROM CROWDSOURCING ACTIVITIES, SOCIAL MEDIA AND CO-DESIGN PROJECTS?



YES, AND BUT WE ALSO NEED TO COLLECT ENOUGH METADATA, THIS IS ALL THE EXTRA INFORMATION ABOUT THE DATA ITSELF.



HOLD ON, DO I NEED TO MANUALLY MAKE SURE ALL THIS METADATA GETS CAPTURED?



NO NEED! COBWEB GATHERS UP ALL THIS METADATA AUTOMATICALLY WHENEVER DATA IS COLLECTED.

THE 7 PILLARS OF ASSESSING AND CLASSIFYING QUALITY INCLUDE A NUMBER OF WAYS TO INVESTIGATE THE DATA WE GET FROM CITIZEN SCIENCE.

1. LOCATION BASED SERVICES
I.E. ASSESSING SPATIAL ACCURACY USING ESTIMATE FROM MOBILE DEVICE AND A NUMBER OF SATELLITES

2. CLEANING
I.E. REMOVING JUNK DATA WITH AN ATTRIBUTE TEXT CHECK

3. AUTOMATIC VALIDATION
I.E. ANALYSIS OF WHETHER AN IMAGE IS BLURRY

7. SEMANTIC HARMONISATION
I.E. USING AN ONTOLOGY TO RECOGNISE MULTIPLE ENTRIES OF THE SAME OBSERVATION

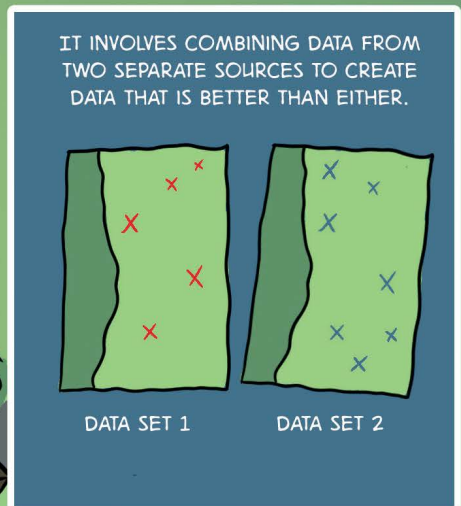
6. BIG/LINKED DATA
I.E. QUERYING TWITTER VIA A HASHTAG FOR SIMILAR PHENOMENA

5. MODEL BASED VALIDATION
I.E. RUNNING A FLOOD MODEL

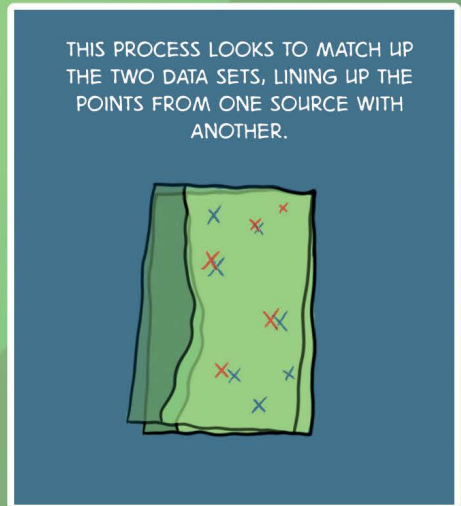
4. COMPARISON WITH AUTHORITY DATA



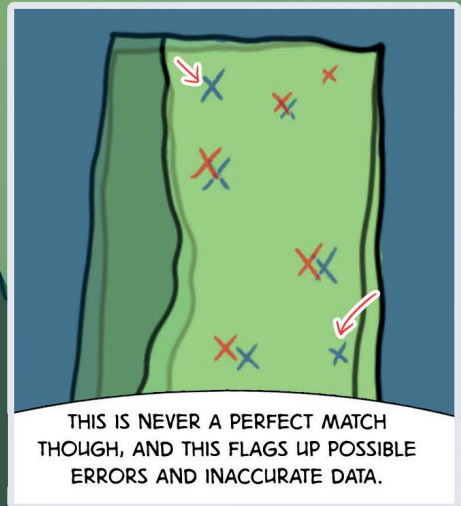
CONFLATION, IS ANOTHER KEY WAY OF MAKING SURE DATA IS OF A HIGH QUALITY.



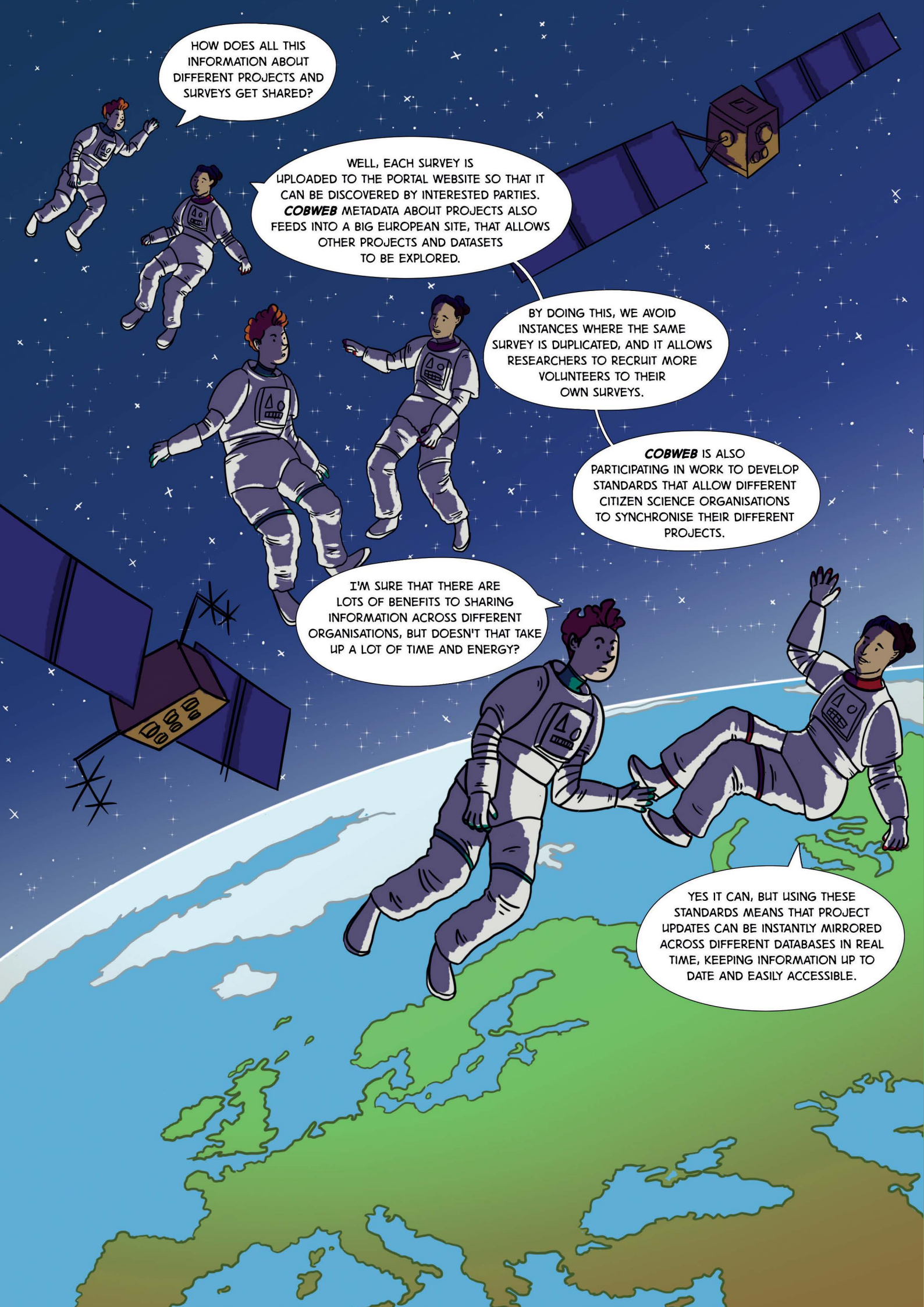
IT INVOLVES COMBINING DATA FROM TWO SEPARATE SOURCES TO CREATE DATA THAT IS BETTER THAN EITHER.



THIS PROCESS LOOKS TO MATCH UP THE TWO DATA SETS, LINING UP THE POINTS FROM ONE SOURCE WITH ANOTHER.



THIS IS NEVER A PERFECT MATCH THOUGH, AND THIS FLAGS UP POSSIBLE ERRORS AND INACCURATE DATA.



HOW DOES ALL THIS INFORMATION ABOUT DIFFERENT PROJECTS AND SURVEYS GET SHARED?

WELL, EACH SURVEY IS UPLOADED TO THE PORTAL WEBSITE SO THAT IT CAN BE DISCOVERED BY INTERESTED PARTIES. **COBWEB** METADATA ABOUT PROJECTS ALSO FEEDS INTO A BIG EUROPEAN SITE, THAT ALLOWS OTHER PROJECTS AND DATASETS TO BE EXPLORED.

BY DOING THIS, WE AVOID INSTANCES WHERE THE SAME SURVEY IS DUPLICATED, AND IT ALLOWS RESEARCHERS TO RECRUIT MORE VOLUNTEERS TO THEIR OWN SURVEYS.

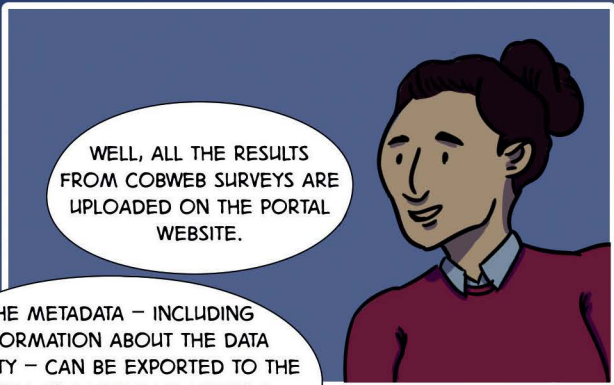
COBWEB IS ALSO PARTICIPATING IN WORK TO DEVELOP STANDARDS THAT ALLOW DIFFERENT CITIZEN SCIENCE ORGANISATIONS TO SYNCHRONISE THEIR DIFFERENT PROJECTS.

I'M SURE THAT THERE ARE LOTS OF BENEFITS TO SHARING INFORMATION ACROSS DIFFERENT ORGANISATIONS, BUT DOESN'T THAT TAKE UP A LOT OF TIME AND ENERGY?

YES IT CAN, BUT USING THESE STANDARDS MEANS THAT PROJECT UPDATES CAN BE INSTANTLY MIRRORED ACROSS DIFFERENT DATABASES IN REAL TIME, KEEPING INFORMATION UP TO DATE AND EASILY ACCESSIBLE.



SO HOW IS THE DATA COLLECTED IN SURVEYS MADE DISCOVERABLE?



WELL, ALL THE RESULTS FROM COBWEB SURVEYS ARE UPLOADED ON THE PORTAL WEBSITE.

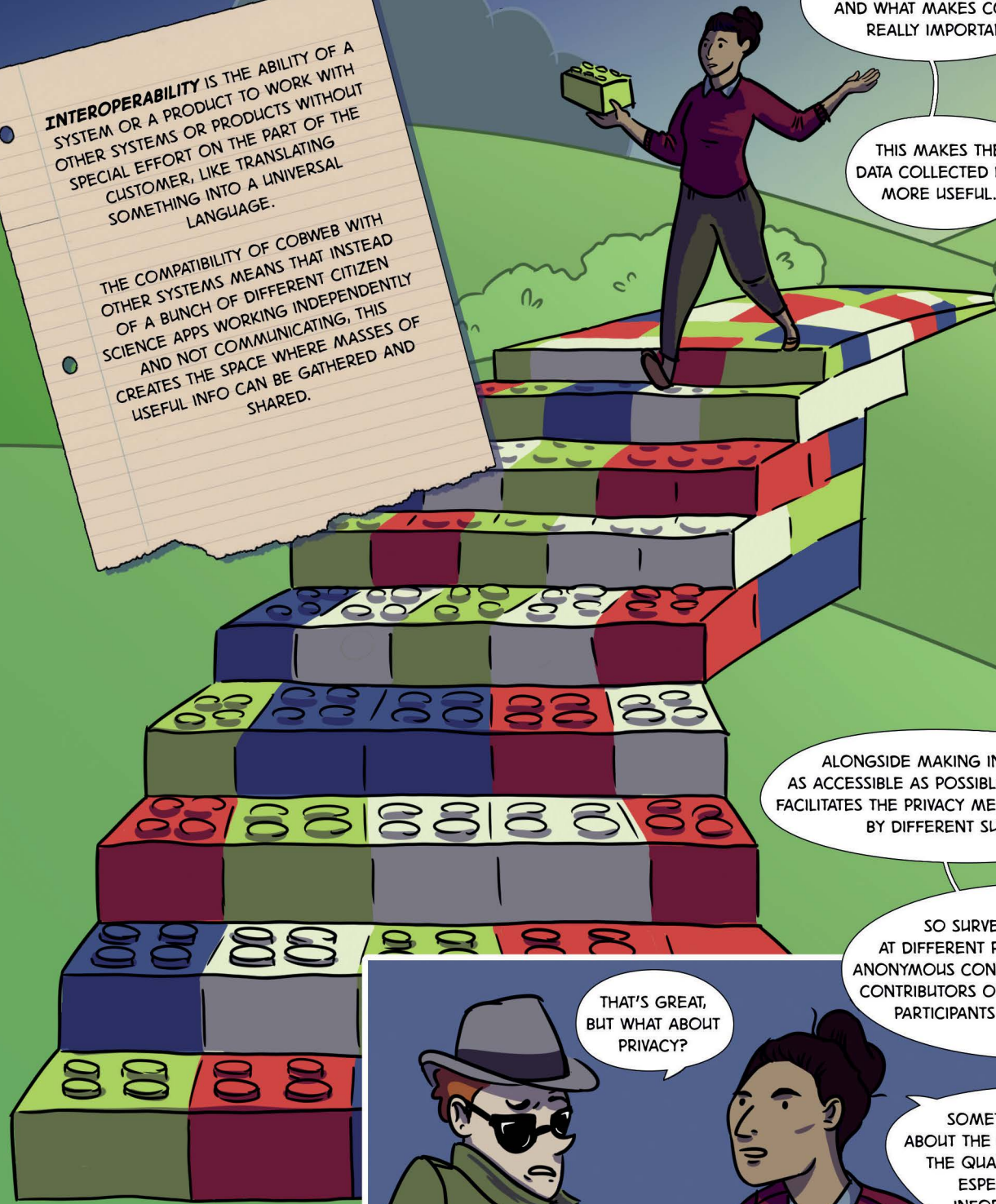
THE METADATA – INCLUDING INFORMATION ABOUT THE DATA QUALITY – CAN BE EXPORTED TO THE PORTAL IN A WAY THAT MEETS A VARIETY OF OPEN STANDARDS.

INTEROPERABILITY IS A HUGE FOCUS OF THE PROJECT, AND WHAT MAKES COBWEB REALLY IMPORTANT.

THIS MAKES THE DATA COLLECTED FAR MORE USEFUL.

INTEROPERABILITY IS THE ABILITY OF A SYSTEM OR A PRODUCT TO WORK WITH OTHER SYSTEMS OR PRODUCTS WITHOUT SPECIAL EFFORT ON THE PART OF THE CUSTOMER, LIKE TRANSLATING SOMETHING INTO A UNIVERSAL LANGUAGE.

THE COMPATIBILITY OF COBWEB WITH OTHER SYSTEMS MEANS THAT INSTEAD OF A BUNCH OF DIFFERENT CITIZEN SCIENCE APPS WORKING INDEPENDENTLY AND NOT COMMUNICATING, THIS CREATES THE SPACE WHERE MASSES OF USEFUL INFO CAN BE GATHERED AND SHARED.



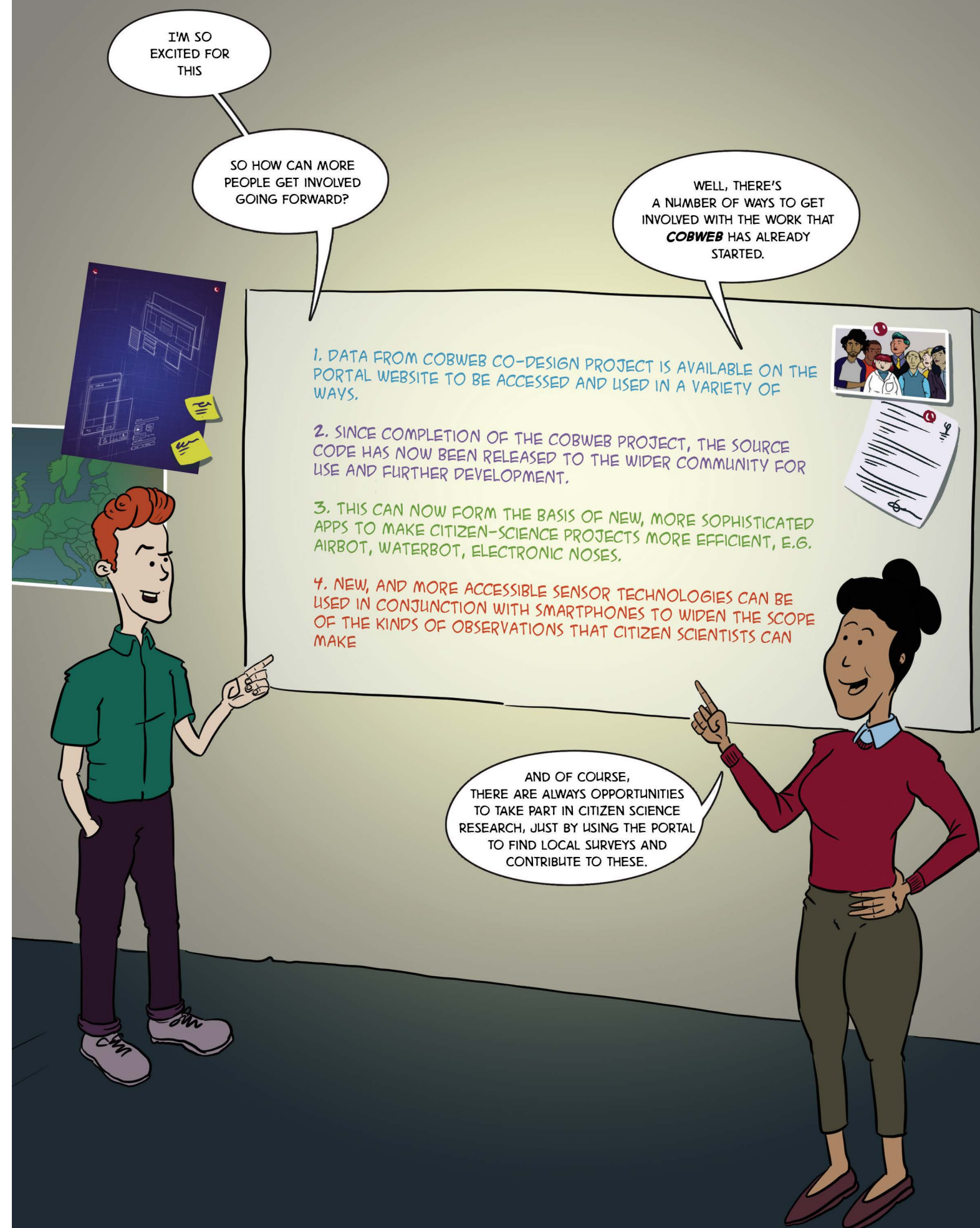
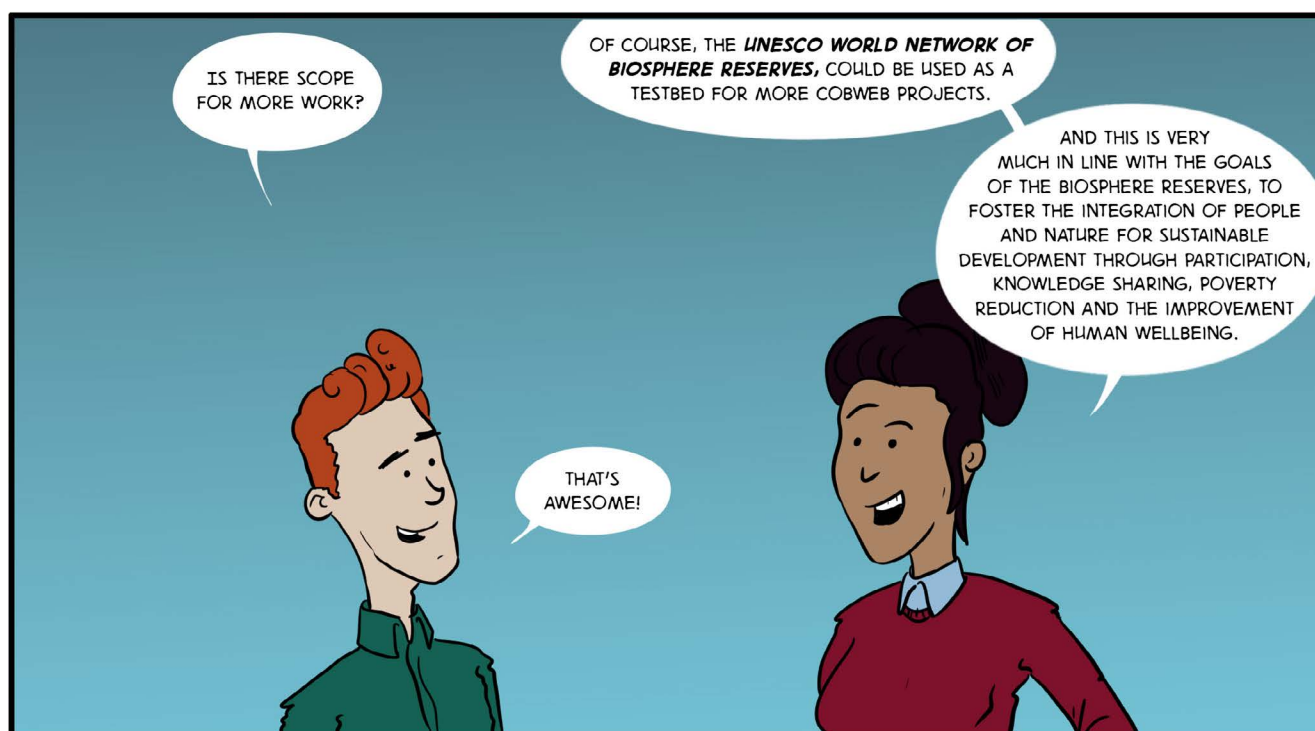
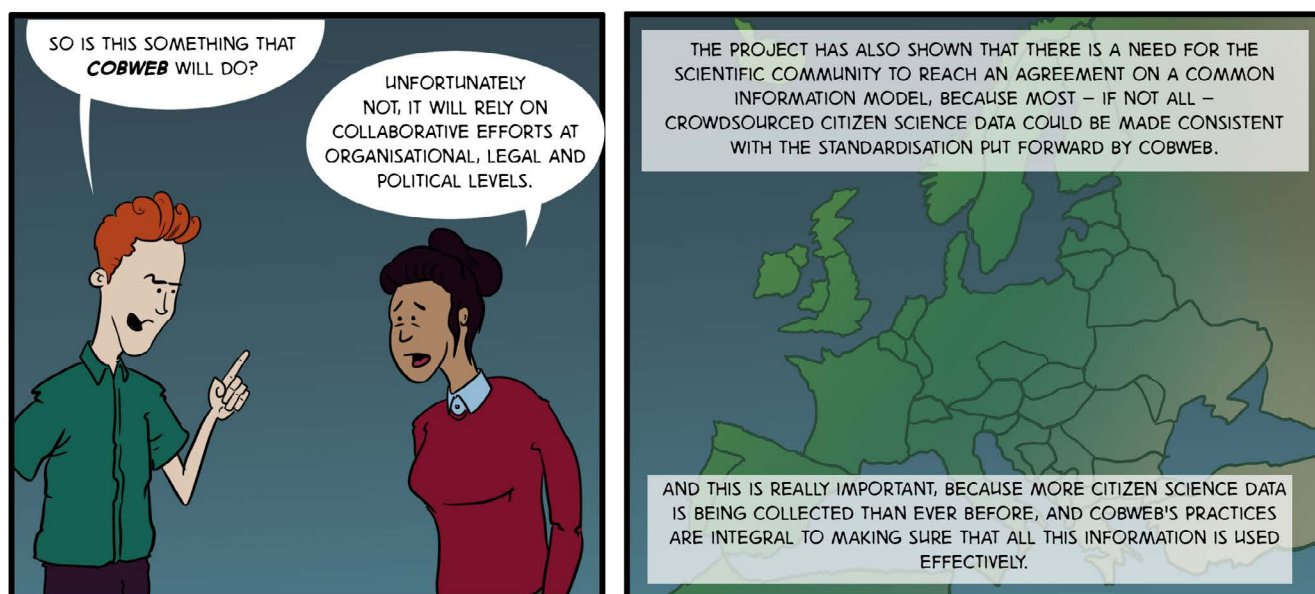
ALONGSIDE MAKING INFORMATION AS ACCESSIBLE AS POSSIBLE, COBWEB ALSO FACILITATES THE PRIVACY MEASURES REQUIRED BY DIFFERENT SURVEYS.

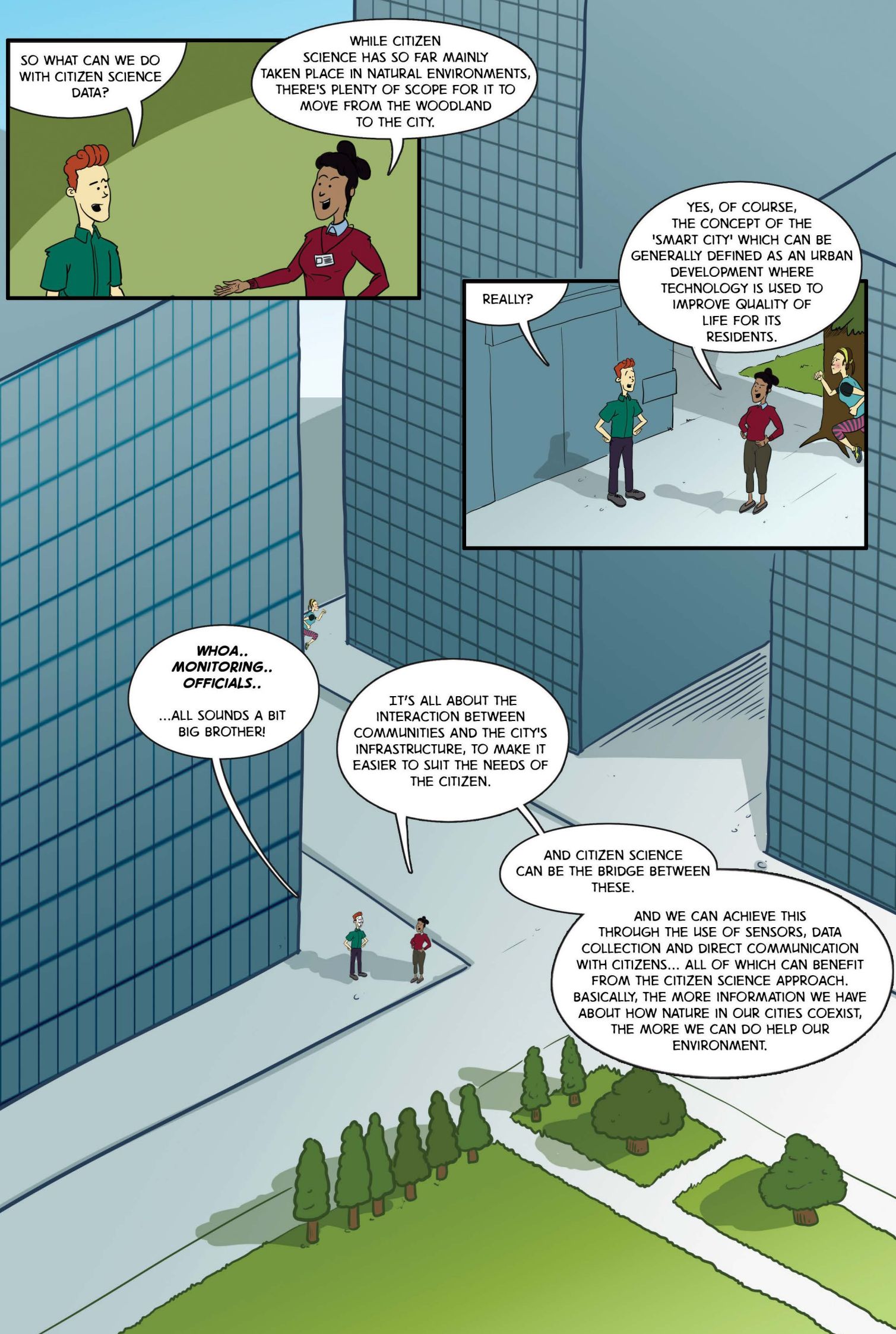
SO SURVEYS CAN BE CREATED AT DIFFERENT PRIVACY LEVELS, ALLOWING ANONYMOUS CONTRIBUTORS, ONLY REGISTERED CONTRIBUTORS OR EVEN SPECIFICALLY INVITED PARTICIPANTS TO PLUG INTO SURVEYS.

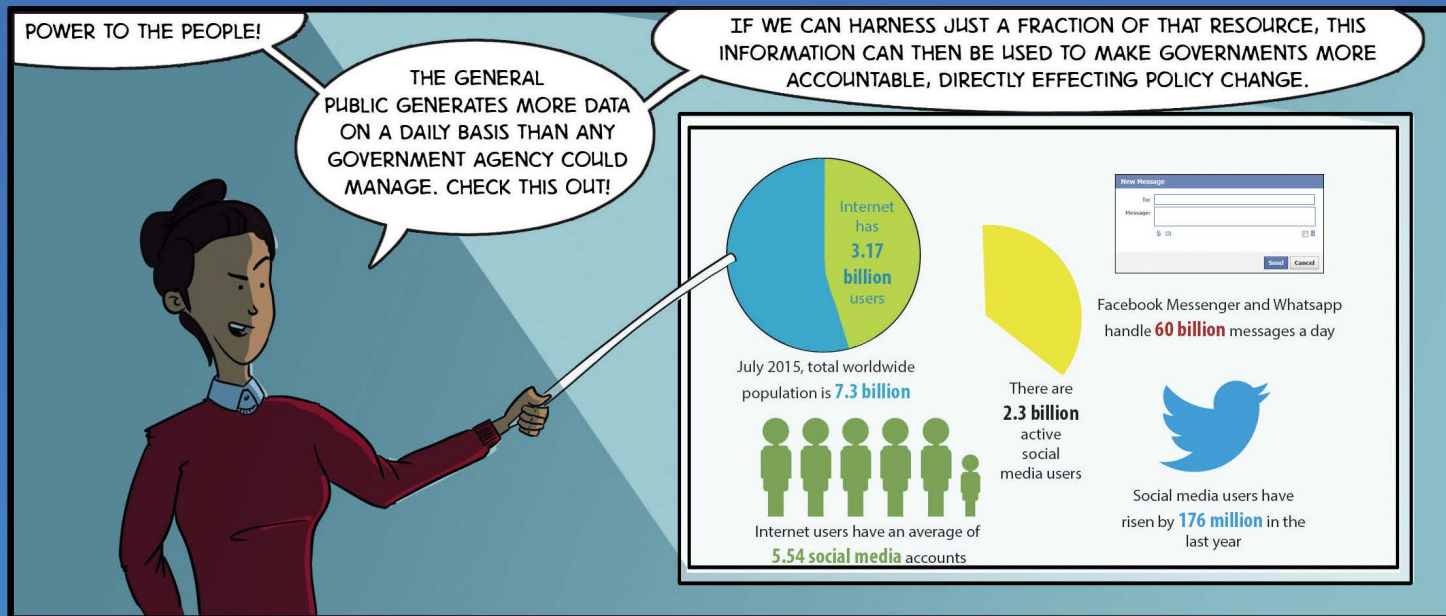


THAT'S GREAT, BUT WHAT ABOUT PRIVACY?

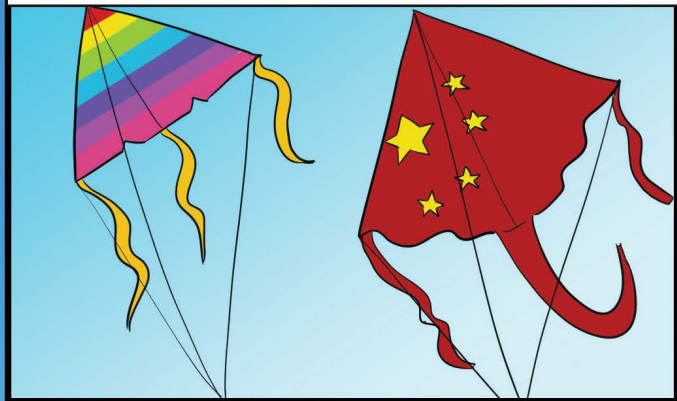
SOMETIMES WE NEED DETAILS ABOUT THE CITIZEN SCIENTISTS TO CHECK THE QUALITY OF THE DATA, AND IT'S ESPECIALLY IMPORTANT THIS INFORMATION IS PROTECTED.







CHECK THIS OUT, CHINESE CITIZENS HAVE ALREADY SEEN THE POWER OF PUBLIC DATA COLLECTION. IN 2011, STATISTICS FROM A MONITOR ATOP THE US EMBASSY IN BEIJING REVEALED THAT THE AIR QUALITY WAS MUCH WORSE THAN GOVERNMENT STATISTICS CLAIMED. THE DISCREPANCIES LED MEMBERS OF THE PUBLIC TO MONITOR THEIR OWN AIR QUALITY, USING BACKPACKS, KITES AND SMARTPHONE APPS, AND A WEBSITE CHARTING THE LIVE RESULTS EMERGED! THIS LED TO REAL CHANGE.



THERE ARE ALREADY REALLY EXCITING EXAMPLES OF CITIZEN SCIENCE HAVING A MAJOR IMPACT ON DAY-TO-DAY LIVES. IN ARGENTINA, WINGU, A CIVIL SOCIETY ORGANIZATION, COLLABORATES WITH THE COMMUNITY TO MAP THE SLUMS AND OFFERS A CHANNEL FOR ITS 60,000 INHABITANTS TO REPORT PUBLIC SERVICE DELIVERY ISSUES. THE INITIATIVE HAS LED TO A REDISTRIBUTION OF THE EDUCATION BUDGET TO HELP THOSE IN NEED.



Glossary

Is it Citizen Science or Crowd Sourcing (or Crowdsourcing)?

We've used citizen science and crowd sourcing interchangeably as both are about lots of people doing a small piece of work on a task. Citizen science is really just a specific form of crowd sourcing for scientific projects.

UNESCO Biosphere Reserve

Biosphere reserves are internationally recognised sites that promote solutions that reconcile the conservation of biodiversity with its sustainable use. [Find out more about the UNESCO Man and Biosphere Programme.](#)

GPS

The Global Positioning System uses satellite to provide autonomous geo-spatial positioning. This means that when your device wants to know where it (and you) are, it detects the position and signals from satellites in space. Once your device knows how far it is from several nearby satellites it can use that information to calculate its (and your) location on the globe.

Authoritative Data Set

Data collected by experts like monitoring agencies, governments, etc. For more on authoritative data, citizen science, and how data can be used by policy makers read [COBWEB's Value Adding to Crowdsourced Data for Decision Making report.](#)

Semantic Harmonisation

This means the comparison of data to an authoritative definition of a particular concept (a list of these definitive terms is known as an ontology). So, basically it means making sure that when you say you are collecting data on "a tree" I can tell how your idea of what a tree is matches with (or differs from) my definition of a tree.

Access Management Federation

A technology that enables a user to use one set of credentials (username and password) to access lots of different systems and services. It's a bit like having a friend who can vouch for you, reassuring lots of organisations that you are trustworthy.

SWE4CitizenScience or Sensor Web Enablement for Citizen Science

This is a suite of standards for crowdsourcing projects. Find out more [here](#) or access the standards on [GitHub](#).

Inspired to get involved in Citizen Science with COBWEB?

We are keen to work with you, especially if you have a citizen science project you'd like to build, or if you are a developer or organisation that would like to work with our tools and/or code in new and interesting ways! Find out more on our [website](#) or email: edina@ed.ac.uk.

We are keen to make sure that COBWEB's work lives on so we are making our work available under open source licenses. You can find our generic COBWEB application, also known as FieldTrip Open, on [GitHub](#).

European Citizen Science Projects and Programmes

COBWEB: Citizen Observatory Web was one of several Citizen Observatories projects funded by the European Commission as part of their Earth Observations work. [Find out more about this work.](#)

The [European Citizen Science Association](#) works with citizen science projects across Europe and is a great place to find out about some of the fantastic projects currently taking place.



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 308513.

COBWEB is proud to be part of the



Project supporters



Partners

The COBWEB consortium consists of 13 partners from 5 European countries (Ireland, the UK, the Netherlands, Greece and Germany).



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WWW.COBWEBPROJECT.EU

CROWD POWER

THE **COBWEB** GUIDE TO CITIZEN SCIENCE

Crowd Power tells the story of COBWEB, the Citizen OBservatory WEB. A project to empower everyday people with the ability to collect environmental information using mobile devices. And that collected information will then be used in research, decision making and policy formation across the globe.

