TRANSCRIPT EPISODE 2

Citizens + Scientists

A. UNDERWRITER ANNOUNCE 00:15

Announcer, over music:

"THE CROWD & THE CLOUD" is made possible by NSF, the National Science Foundation, Where Discoveries Begin."

1. TEASE
Waleed VO:

WE LIVE IN A COMPLEX AND INTERDEPENDENT WORLD.

THE ENERGY SOURCES WE ALL RELY ON CAN BE DIRTY AND POLLUTING.

Place title slides on:
Park County, Wyoming

AND SOMETIMES THE SYSTEMS WE DEPEND ON FOR PROTECTION FALL SHORT.

Deb Thomas:
There was nothing in place to monitor the air. And so we decided to do it ourselves.

Place locator
North Central Pennsylvania

THAT'S WHEN CITIZEN SCIENCE CAN HELP CLOSE THE GAPS.

Bob Volkmar:
Stream monitoring is something that even us feeble-minded fisherman could be engaged in.

CGI Guardian headline:

Marc Edwards, VO and to camera:
There's no question that millions of Americans are being exposed to lead in drinking water.

Tony Spagnoli:
This is citizen-led science, and here we are, doing the legwork.

Jonathan King:
We are citizens. We are finding people who are concerned about *their* family and their family's health.

Regina Brewington:
You won't know until you test your water, so please everyone, test your water.

China street scenes and mobile phone screens:

IN CHINA, REPORTS OF POLLUTERS CAN BE SHARED FASTER THAN EVER THROUGH SOCIAL MEDIA.

Ma Jun:
We need to take advantage of mobile internet to check about the quality of the rivers and lakes in China.

Waleed to camera and B-roll at work:

I'm Waleed Abdalati.

I was a scientist at NASA for fifteen years. Now I head up an environmental research institute in Boulder, Colorado.

NASA CGI as if on his screen:

SO I'M VERY FAMILIAR WITH *BIG* SCIENCE.

TU fisherman Rob McCormack and wife:

BUT IN THIS SERIES I'VE MET *CITIZEN* SCIENTISTS WHO'VE SHOWN ME A DIFFERENT WAY OF DOING SCIENCE.

Angel and Mariel, birders in the Everglades

THEY'RE BIRDERS COLLECTING DATA, DOCUMENTING WHAT SPECIES LIVE WHERE.

Scott Eustis launches a kite:

THEY'RE MAKERS AND MILLENNIALS CREATING LOW-COST SENSORS TO TRACK POLLUTION.

Cassandra and students patrol West Oakland:

THEY'RE STUDENTS RESEARCHING NEIGHBORHOOD AIR QUALITY

Marbella in the AGU poster hall:

…AND PRESENTING RESULTS TO PROFESSIONAL SCIENTISTS.

Scenes of sensors and citizens from program 2:

CITIZEN SCIENCE, POWERED BY DISRUPTIVE TECHNOLOGIES, IS A NEW WAY TO CAPTURE DATA THAT CAN ULTIMATELY BENEFIT US ALL.

URL CGI:
CrowdAndCloud.org

LOOK FOR URLS INDICATING WHERE TO FIND MORE INFORMATION ON OUR WEBSITE.

CGI pipe travel: Waleed to camera & VO:

IN THIS EPISODE OF THE CROWD AND THE CLOUD, WHERE LEAD IN DRINKING WATER COMES FROM

JR King with wife and kid:

…AND HOW TO PROTECT YOUR FAMILY.

Deb samples, David Carpenter at work, and the Health Letters CGI:

HOW CITIZEN SCIENCE, BACKED UP BY PROFESSIONAL RESEARCHERS, CAN IMPACT PUBLIC POLICY.

Tony at laptop and Facebook message pop up CGI:

…AND HOW SOCIAL MEDIA CAN BE WAY MORE THAN GAMES.

Waleed on camera:

That's all in this episode of THE CROWD & THE CLOUD…

"CITIZENS PLUS SCIENTISTS."

B. SERIES & EPISODE TITLE (00:30)
2. CITIZENS + SCIENTISTS

Waleed to camera and VO stock footage from Flint
The situation in Flint, Michigan made headlines for months, as city residents and the whole country learned, what was supposed to be a cost saving measure had gone dramatically wrong.

Waleed on camera:
Many other communities wondered "could it also happen here?"

This is a story touching on complex laws and regulations, but at its heart it's about families and the safety of the water they're drinking.

Here's how citizen science tried to fill the information and trust gap in Philadelphia.

Music. Philly skyline.

PHILLY UNLEADED
Citizens + Scientists, United

City scenes, driving upbeat music, and text overlays:

Population
1,562,000

Homes built pre-1919
270,000+

L3
Regina Brewington
West Philadelphia resident

Regina Brewington
I've lived in West Philadelphia all my life. This is a beautiful neighborhood. The houses are at least, like, a hundred years old.

Lead Service Line CGI and Tony to camera:

Tony:
Of course Philadelphia is an old city many of the pipes here are installed from before 1970s when they outlawed lead pipes.

L3
Myra Young
Nicetown resident

Myra:
I was born and raised in Philadelphia. (She points.) My water pipe is right there.

L3
Tony Spagnoli
Mt. Airy resident
PHILLY UNLEADED co-founder

Tony:
The Water Department they don't have an official count, or at least they don't have an official count they are releasing about how many pipes are lead service pipes in the city, but they estimate upwards of 50,000 or more.

Downtown and people shots:

Philadelphia, with a population of a million and a half people, we think there's probably a lot more.

IT WAS NOT JUST THE *AGE* OF THE HOUSES, BUT ALSO HOW THE AUTHORITIES IN FLINT HAD MISLED THE PUBLIC THAT MADE SOME PHILADELPHIANS CONCERNED.

Tony:
So this whole thing got started through a simple question on a Facebook group that I am part of, and the question was, "Does Philly have a free lead testing program for tap water?"

L3
Jonathan King
Pt.Breeze resident
PHILLY UNLEADED co-founder

Jonathan:
How do we test out our own water, the water that we're giving to our children?

Jonathan King's wife laughs, off camera:
Hee, hee, hee…

Tony:
We thought, fifteen hundred members we should buy the testing equipment in bulk and just plot out the results.

And a couple of people said, "Oh, that's interesting," and I said yeah that is interesting.

Jonathan:
I'm just the kind of the type of person that would call Mark Edwards at Virginia Tech and ask him, how would I test my water?

VT stock footage of Marc at work in Flint, MI:

MARC EDWARDS WAS THE RESEARCHER WHOSE LABORATORY AT VIRGINIA TECH FINALLY CONFIRMED FLINT RESIDENTS' SUSPICIONS THAT THEIR WATER WAS SERIOUSLY CONTAMINATED.

NOW IN TWO THOUSAND SIXTEEN IT WAS PHILADELPHIA FAMILIES WHO WERE CONCERNED.

Scenes of both black and white families in Philly:

Marc:
He had information about what was occurring in Philadelphia and quite frankly it kind of shocked me.

Guardian headline CGI:

MEDIA REPORTS NOTED THAT THE PHILADELPHIA WATER DEPARTMENT WASN'T FOLLOWING EPA'S GUIDELINES ON HOW TO TEST FOR LEAD.

CGI of PWD sampling instructions:

UNTIL RECENTLY THEIR SAMPLING PROCEDURES ADVISED PEOPLE TO REMOVE AERATORS, AND TO RUN COLD WATER FOR TWO MINUTES BEFORE THE SIX HOUR STAGNATION PERIOD.

BOTH APPROACHES CAN ARTIFICIALLY LESSEN EVIDENCE OF LEAD IN THE WATER.

Philly Unleaded website page CGI:

TONY AND JONATHAN FORMED THE "PHILLY UNLEADED" PROJECT IN ORDER TO GATHER MORE PRÉCISE INFORMATION ABOUT LEAD LEVELS.

Marc:
We, in civil engineering, our highest priority is to protect the public welfare, and that's what's at stake here.

Jonathan:
And he said if you get a number of people in Philadelphia we will test everybody's water, and we'll see what's going on here, and we will do it at cost.

"Witnesses to Hunger," meeting around a table at Drexel University, laughter:

Tony:

But then we expanded this network of other community organizations and groups to be able to have a kind of fuller picture of what's going on.

Back to Tony on camera:

But it all started on Facebook.

ANOTHER GROUP OF CONCERNED CITIZENS IS PART OF AN INITIATIVE AT DREXEL UNIVERSITY CALLED "WITNESSES TO HUNGER."

Myra Young addresses a meeting of community members:

Myra:
They gave us a camera and told us to take pictures, and we did that.

(They laugh)

Family photos of Myra/Nike and Tianna:

"WITNESSES" DOCUMENT THEIR DAILY LIVES IN PHOTOGRAPHS SHARED WITH LAWMAKERS AND OTHERS, SHOWING HOW HUNGER IMPACTS FAMILIES.

L3:
Michelle Taylor
Program Manager, Witnesses to Hunger

Michelle Taylor:
It's not just about not being able to make the ends meet. It's about how poverty affects so many of the facets of our lives.

Running water: Suleimon drinking.

GIVEN COMMUNITY CONCERNS, THE WITNESSES ADDED DRINKING WATER SAFETY TO POVERTY AND HUNGER.

Mariana at Drexel meeting:

THE GROUP HAD BEEN FOUNDED BY ANTHROPOLOGIST MARIANA CHILTON.

See Yanna on the big screen:

SHE'D ATTENDED GRADUATE SCHOOL WITH YANNA LAMBRINIDOU.

Mariana:
Hi, Yanna, can you hear us?

Yanna:
Hi, everybody.

YANNA HAD BEEN ONE OF THE RESEARCHERS MOVED TO TAKE ACTION BY AN EARLIER LEAD CRISIS IN WASHINGTON DC.

Yanna off camera:
This is a lead pipe and it's over 100 years old.

Mariana:
I'm gonna pass it around so people can see.

Witness, off camera:
Oh, it's corroded.

Mariana:
It's soft, right.

Mariana:
100 years old.

L3
Yanna Lambrinidou
Parents for Nontoxic Alternatives

Yanna:
Our schools in Washington DC had tested just a few taps. And they found serious contamination of lead, and nobody had told us about it.

Witness, off camera:
That's outrageous.

Yanna:
That was the end for me.

This law, the federal law on lead in drinking water, considers us, parents and residents, consumers of water, partly responsible for protecting ourselves from lead in drinking water.

L3
Tianna Gaines-Turner
Witnesses to Hunger

Tianna:
But we responsible to pay our bill on time or they will shut us off but you're not responsible to make sure that we're not drinking water with lead in it?

That's a bunch of BS.

L3
Angela Sutton
Witnesses to Hunger

Angela:

It's a shame, because a lot of us are so …clueless about what lead is, and we don't… cause we are dealing with everyday struggles, that the last thing we should have to worry about is our water being unsafe.

Witnesses:
Uh…Huh!

L3
Emily Edwards
Witnesses to Hunger

Emily:
You know how we always had that saying, "What you don't know won't hurt you."

Witnesses:
Mh, huh!

Agreeing cross-talk:

Emily:
Don't you feel like that's what they are doing, but what we don't know is really what is hurting us.

SDWA statutory language from Federal Register, CGI:

THE "SAFE DRINKING WATER ACT" IS THE FEDERAL LAW THAT PROTECTS THE WATER WE DRINK.

EPA summary of LCR:

PART OF THE ACT IS THE SO-CALLED "LEAD AND COPPER RULE," "L-C-R", THAT MANDATES EXACTLY HOW PUBLIC WATER SYSTEMS MUST TEST DRINKING WATER, AND WHAT STANDARDS MUST BE MET.

Kitchen scenes in JR King's home:

MOST AMERICANS ASSUME THE "CLEAN DRINKING WATER ACT" REQUIRES LOCAL WATER AUTHORITIES TO DELIVER SAFE, CLEAN WATER ALL THE WAY TO THE KITCHEN FAUCET.

IT TURNS OUT, HOWEVER, THAT THIS IS NOT HOW THINGS ACTUALLY WORK.

Jonathan in his basement:

Jonathan King:
So here's the service line, right, and it's coming from the street. It's under the sidewalk.

If you were to ask somebody, you know, if this pipe is leaching lead, is it my responsibility or is it the City's? Y'know, I think people would think, "Oh it's the City's, it's out there, right."

But meanwhile the City is saying "Hey, it's under your sidewalk, and it's your responsibility", and people don't even realize that.

Michelle Taylor:
Who has heard of lead poisoning? What is lead poisoning? What does that mean? Somebody tell me. Yes,

ma'am.

Caption:
It messes your blood and stuff
and can mentally throw you off.

Witness:
It messes your blood and stuff and can mentally throw you off.

Michelle:
Who's heard of what happened in Flint, Michigan?

Chorus of agreement, "Yeah's", etc.

Philly.com headline CGI:

IN EARLY 2016 REPORTERS CONTINUED TO QUESTION HOW PHILADELPHIA TESTED ITS WATER.

IN MARCH, CITY COUNCIL MEMBERS HELD HEARINGS TO EXPLORE THE ISSUES.

THE HEARING STARTED WITH TESTIMONY FROM PHILADELPHIA'S WATER COMMISSIONER.

Debra McCarty:
Good morning. My name is Debra McCarty. I am Commissioner of the Water Department.

First and foremost, let me begin by noting that Philadelphia's drinking water is lead free, and that there are clear differences between Flint and Philadelphia.

COMMISSIONER MCCARTY MAY BE CORRECT ABOUT THE WATER *LEAVING* THE CITY'S TREATMENT PLANTS AND FLOWING THROUGH ITS MAINS.

Running water from homes black and white:

BUT YOU CAN ONLY KNOW IT'S SAFE AT THE TAP IF YOU ACCURATELY TEST THE WATER AFTER IT'S PASSED THROUGH THE SERVICE LINES THAT CONNECT THE CITY'S MAINS TO THE FAUCETS IN YOUR HOME.

Myra walks down into her basement to check for a LSL:

AND *THAT'S* WHEN A HOME OWNERS "SHARED RESPONSIBILITY" FOR DRINKING WATER SAFETY KICKS IN.

Marc:
The water industry has not really been an honest broker.

If you're going to have a shared responsibility law, you need an honest broker explaining, here's our part of the responsibility, here's your part.

CGI trip: Virtual camera moves down large CGI water main, made out of either PVC or concrete:

IN MOST CITIES, THE MAINS ARE MADE OF IRON, CONCRETE OR RUGGED PLASTIC.

Camera turns from main to smaller LSL with areas of scale:

BUT THEN IN THE HOMES OF SOME FIFTEEN TO TWENTY TWO MILLION AMERICANS…

AMAZINGLY ENOUGH NO ONE HAS AN EXACT NUMBER…

…THAT WATER TRANSITIONS FROM THE CITY'S MAINS TO LEAD-SERVICE LINES.

Marc:
And that's where the majority of lead pipes are in this country.

THEY'RE TOUGH AND DURABLE, WHICH IS WHY USING LEAD SEEMED LIKE SUCH A GOOD IDEA AT THE TIME… AND WAS MANDATED BY CITY GOVERNMENTS LIKE CHICAGO.

BUT WE NOW KNOW LEAD SERVICE LINES ARE RISKY AND ALWAYS HAVE THE POTENTIAL TO LEACH THIS DANGEROUS NEUROTOXIN.

Camera stops at area of scale as pieces flake off and join water:

Marc:
It's like the equivalent of drinking the water through this lead straw.

The white scale dissolves off the pipe:

WHEN THE WATER ISN'T TREATED WITH THE RIGHT KIND AND AMOUNT OF "CORROSION CONTROL CHEMICALS"…

CCT disappears:

…LEAD LEACHES OUT OF THE PIPES, LIKE SUGAR DISSOLVING INTO WATER.

The copper:lead join releases chunks of lead scale.

REPLACING PART OF A LEAD SERVICE LINE WITH COPPER CAN ALSO BE A PROBLEM BECAUSE THE JOINT BETWEEN THE TWO CAN CREATE "GALVANIC CORROSION" WHICH MAY ACTUALLY RELEASE TWICE AS MUCH LEAD AS THE OLDER PIPES.

Close up footage of jackhammer/CGI pipe shakes:

ROAD WORK NEARBY CAN RELEASE LEAD-BEARING RUST INTO THE WATER AS PARTICLES.

Marc:
This is chemically equivalent to lead paint chips falling into your water.

Camera continues through copper lines, stops at solder joint, "cloud" dissolves from solder into water:

EVEN WHERE COPPER IS USED INSIDE A HOUSE, SOLDER CONTAINING LEAD TO JOIN THE PIPES WAS LEGAL UNTIL 1986.

THAT LEAD CAN ALSO DISSOLVE INTO THE WATER.

Moving on: we see a valve, also from the inside:

AND BRASS FIXTURES SUCH AS FAUCETS CAN STILL CONTAIN LEAD, ALTHOUGH IN SMALLER AMOUNTS SINCE 2014.

Camera continues, past several turns, comes up to aerator with column behind, flakes enter from over shoulder and settling on mesh:

AT THE TAP ITSELF, THE FINE MESH OF AN AERATOR TRAPS SOLID PARTICLES, CREATING HIGH CONCENTRATIONS OF LEAD, RIGHT WHERE YOU AND YOUR FAMILY DRINK FROM.

Marc:
Ultimately, the burden for protecting your family and your children, it falls on you, even when the law is working.

Intro David Masur and the Penn Environment group:

BUT HOW TO FIND OUT IF YOU WATER REALLY DOES CONTAIN LEAD?

DAVID MASUR WORKS WITH "PENN ENVIRONMENT," A CITIZENS' GROUP WHOSE MEMBERS STARTED ASKING ABOUT TESTING.

David:
We can just go around the floor and folks can say a little about why you care about lead in drinking water.

L3
Brad Dakake
South of South St. resident

Brad:
You know as a father of two I am always concerned about what's the best thing for my kids.

L3
Catherine Devigne
South of South St. resident

Catherine:
I have two kids. I live right around the corner and my two and a half year-old just tested slightly elevated for lead.

My pediatrician was like "Don't be concerned, you know. Most kids in Philadelphia test slightly high." And I'm like "What?!?"

(Laughter.)

Woman:
So, OK, deep breath.

David and Mariana, intercut, explain the testing set-up:

David:
Under the Safe Drinking Water Act every three years municipalities have to do a small test sample for lead.

What that means for the Philadelphia Water Department is they have to collect between fifty and a hundred samples out of the 700,000 homes in Philadelphia to test for lead from high-risk homes.

CGI map based on PWD data:

IN 2014, THE WATER DEPARTMENT WAS ONLY ABLE TO SAMPLE 42 OF THE VERY *HIGHEST* RISK HOMES, 34 WITH LEAD SERVICE LINES AND 8 MORE WITH LEAD SOLDER, INSTEAD OF EPA's TARGET OF 50.

Gary Burlingame at City Council hearings:

GARY BURLINGAME, HEAD OF THE WATER DEPARTMENT'S LABORATORY, WAS QUOTED AS SAYING "PEOPLE AREN'T RESPONDING" AS ONE REASON FOR THE NUMBER OF LOW "TIER 1" TEST SITES

CGI with Tier 3 pop-ons:

THEY DID ADD 92 LOWER RISK HOMES WITH LEAD SOLDER FOR A TOTAL OF 134 SAMPLES.

Mariana:
If you look at the map, they are completely missing most of the super-poor areas.

Mariana's map as CGI:

Only 4 of the tests were in very low-income neighborhoods, and one of those four was the actual Water Commissioner's home.

David:
And we said, y'know, let's show how easy it is. We are a bunch of, y'know, bootstrapping nonprofit groups, and we'll get 50-100 tests ourselves.

L3
Mariana Chilton
Director, Center for Hunger-Free Communities

Mariana:
Even if we find no lead in the water, that's fantastic, very good, but in the meantime the Philadelphia Water Department has not been accountable to the citizens of Philadelphia. They need to communicate better and they need to change their practices…

David:
We will get the results tested and we'll show the Water Department that there is no reason they should not comply with the federal drinking water standards.

Mariana:
They are gearing up to test the water next summer. Alright, but we are going to beat them to it and we

are going to follow the EPA guidelines with our friends at Virginia Tech.

AFTER MEETING WITH TONY, JONATHAN, AND THE WITNESSES, "PENN ENVIRONMENT" PAID FOR 150 TEST KITS, WHICH VIRGINIA TECH OFFERED TO PROVIDE AND ANALYZE AT COST.

Tony and David at David's home:

BY JULY 19TH THE FIRST SET OF KITS HAD ARRIVED AND WERE READY FOR DISTRIBUTION.

Myra does a scratch test for an LSL.

(Music)

BOTH PENN ENVIRONMENT AND THE WITNESSES RAN TRAINING SESSIONS TO ENSURE PARTICIPANTS UNDERSTOOD HOW TO DO THE TESTS CORRECTLY.

David:
So I hope you signed your field trip waiver today to go to the kitchen and we will do sort of a dry run of how the kits work.

Michelle:
And it's very important that you pay attention because it has to be done a specific way.

David:
Step one, after the water has not been used for at least six hours, open the kit and remove the plastic caps from all three bottles.

Tianna:
As long as the water is sitting and no one is flushing or anything for six hours.

Angela:
If you use the washing machine or the dishwasher, use anything before six hours it can throw off the testing.

L3
Sherita Mouzon
Witnesses to Hunger

Sherita:
Make sure that your tap water is on cold already.

Angela:
And it *must* be cold water!

David:
So you do the first bottle and you fill it up. Then you're gonna let the water run for 45 seconds, and then we fill the second bottle up. And then we're gonna let the water run for two minutes and fill the little bottle up.

Angela:

OK, ready? We're going to fill it all the way to the top. Go.

(Water running and a musical bridge)

David:
We got our first bottle. We will set that aside.

Tianna:
You have to wait 45 seconds before you can fill up the second one.

Angela:
And the key to this is not to turn off the water.

Maya and Suleimon:
Yes…

Angela:
We're hoping for good water.

David:
If you think it's hard to sit for 45 seconds, wait till we have to wait for two minutes.

Mya and Suleimon:
Awright, 45 seconds.

David:
Our second test.

(Water runs)

Angela:
Why do you think they got it so far apart? What y'all think?

Open caption:
…maybe it has different amounts of lead in it.

Kid off camera.
Because maybe it has different amounts of lead in it.

Angela:
Good job. And we are doing it the right way. Because the Water Department is not doing it by protocol.

(Water runs)

David:
We need like background music. Maybe we should just pass around the donuts, real quick.

People take donuts and mumble:

David:

Another two minutes, yeah. Yeah.

Tianna:
It is a long time, but, you know, we all might be trying to get our weight down. Might do a couple of squats.

(Laughter)

Tianna:
You know whatever you want to do. Couple of stretches.

Angela:
This is the longest two minutes in the world so we can dance. Do do do do dooh….

Open caption:
No, mom.

Kid:
No, mom.

Angela:
5… 4… 3… 2… and one. All done.

Suleimon:
We put them in here. So.

Mya:
Make sure the tap…

Open caption:
Then we're going to send them to the science factory.

Suleimon, with sub-titles:
Then we're going to send them to the science factory.

"PHILLY UNLEADED'S" MOTIVATION FOR INDEPENDENT TESTING WAS DRIVEN IN LARGE PART BY THE WATER DEPARTMENT *NOT* FOLLOWING CURRENT EPA GUIDELINES.

Marc:
Should Moms and Dads have to give up their life to do a job that we pay people and pay people well to do?

Ah, yes, because unfortunately, they refuse to do the job.

Tony delivers test kits in various neighborhoods:

Tony:
So, we are cruising around Philadelphia today…

Y'know, this is citizen-led science. And here we are, doing the legwork.

We have no one to pay because we have no money.

Jonathan:
We're trying to get test kits in as many homes as possible, anywhere in the city, anyone who signed up.

Tony:
Good data is important to this project, and to any, I think, citizen-led project, and any science project. You want the work that you've put into it to be verifiable and useful.

Jonathan:
So hopefully we're able to comply with the Lead and Copper Rule with our citizens' science test. But I can't stress this enough.

Exterior of PWD building and City Council hearing:

The Philadelphia Water Department has an obligation to follow the Lead and Copper rule.
That is *their* obligation. We are citizens. We are volunteers.

Witnesses and other family shots:

We are finding people who are concerned about *their* family and their family's health. And we are getting the *best* testing procedure available into *their* hands so that they can test *their* water that they're giving to *their* family.

Jonathan jiggles kid, chuckles: "Yeah!" Then see stacks of boxes and VT exterior:

THE FIRST KITS TO ARRIVE AT VIRGINIA TECH CAME FROM THE "WITNESSES TO HUNGER" INITIATIVE…

Jeff Parks:
Let me get my gloves on first here.

JEFF PARKS HAD WORKED ON THE SAMPLES FROM FLINT.

NOW HE MOVED ON TO THOSE FROM PHILLY.

Jeff:
So this is kit number 104. "P 1 zero 4" for Philadelphia.

So what the acid will do, it will dissolve any particles of any metals or scales or anything that came from the plumbing.

THE MAXIMUM ALLOWABLE AMOUNT OF LEAD IN ANY WATER SYSTEM IS 15 PARTS PER BILLION IN 10 PERCENT OF THE HOMES TESTED.

BUT THAT'S AN ARBITRARY LEVEL.

ANY AMOUNT OF LEAD IN WATER IS A POTENTIAL HEALTH HAZARD, ESPECIALLY TO THE VERY YOUNG AND VERY OLD.

Jeff:
We can see levels of lead very accurately as low as 0.2 parts per billion.

WHEN ALL THE SAMPLES WERE ANALYZED, THERE WAS GOOD NEWS… AND BAD NEWS.

MOST OF THE TESTS WERE BELOW THE 15 PARTS PER BILLION THRESHOLD.

Stills of Jonathan and family:

BUT JONATHAN KING'S HOME CAME IN AT FORTY EIGHT PARTS PER BILLION, THREE TIMES THE EPA ACTION LEVEL.

HIS DAUGHTER'S DOCTOR SAID SHE'S COMPLETELY FINE, BUT JONATHAN IS MYSTIFIED, SINCE HE THOUGHT HE HAD NO LEAD ANYWHERE IN HIS SYSTEM, WHICH GOES TO SHOW THE VALUE OF TESTING.

CGI EPA Region 3 letter, with details:

AND NO MATTER THE RESULTS, CITIZEN ACTION HAS ALREADY HELPED PRESSURE THE FEDERAL EPA INTO INSISTING THAT THE PHILADELPHIA WATER DEPARTMENT FOLLOW BEST PRACTICES IN TESTING…

…THE VERY SAME PROCEDURES THE "PHILLY UNLEADED "PROJECT HAS BEEN USING.

David Masur:
The Water Department, sort of trying to take a more pro-active position, is absolutely due to the public scrutiny, the public saying they are gonna take the bull by the horns, and do it themselves.
21:06

Emily:
How can we help the Philadelphia Water Department help us.

NOT BAD FOR CITIZENS PLUS SCIENTISTS.

Waleed on camera, in kitchen, with a PUR and a Brita filter:

So, what to do if you're concerned? Experts say there's something anyone with a lead service line, or who thinks they might have one, can and should do.

CU of box with NSF logo:

Install a filter on your faucet that's certified to cut back on lead and other harmful contaminants. They cost as little as 16 dollars, but they do need their cartridges replaced every couple months.

Cut to LIVE UNITED still of Regina holding a test kit box, with URL over:

CGI URL:
CrowdAndCloud.org/Unleaded

There's more information on how to protect yourself and your family on our website.

(Music fades)

Dip to black.

2: BUCKET BRIGADE

Waleed to camera:

Is citizen science really science? Well, when results are published in peer-reviewed journals, there's no doubt it's science.

This is a story of what happens when citizens and professional scientists work together to gather data on one of today's most controversial topics… hydraulic fracturing, or fracking.

The "Bucket Brigade" &
Air Quality

Wyoming landscape:

(Music)

Deb Thomas
Both Dick and I have spent a lot of time in the outdoors, of course, because we both grew up in Montana, and spent a lot of time tromping the hills.

And that was a big thing about buying this place, was we were surrounded by public land, and so we can literally leave this property, and ride on horseback for days, weeks, if we'd want to.

Elk footage, and moonset timelapse:

We had a lot of wildlife. There are huge elk herds that moved through here at that time. Really quiet, just incredible night skies, incredible stars. So, that was really beautiful.

We were here for five years when the development started.

L3
Deb Thomas
Resident, Clark WY.

And then, you know, it's the same story you hear everywhere.

Aerial shots of oil and gas infrastructure:

David Carpenter:
Natural gas is formed just like coal is formed, oil is formed, from the decay of organic material.

L3:
David Carpenter, M.D
Dir, Inst. for Health & the Environment
Univ. at Albany, SUNY

Fracking has been done for a long time. What's changed in the last few years is unconventional oil and gas exploration, hydrofracking, or fracturing.

Aerials show Deb leading horses over ridge:

Deb:
We were riding our horses up across a state section that's right across the road from our place, and we noticed a bunch of survey flags. And so we started calling around. We called the state. We called the county. We called our local representatives. Nobody could tell us anything.

In Wyoming, on state land, the companies can come in and prepare the pad and put the pits in before they actually get their permit to drill, and so there was no record.

They "dozed" off about a two acre pad and put in two pits that held an acre-foot each of fluids.

So at that point we knew it was some kind of oil and gas development.

Truck rolls down gravel road:

It took right at 100 double "semi" loads to get the rig in. It was a triple rig.

Y'know, the traffic went from maybe 3 or 4 cars a week to, like, 50 a day. Tons of dust on this county road.

They'd flare for months. They'd light the flare and the whole creek [laughs] bottom would shake, and so our house would just shake. Lots of noise.

All the wildlife (gesture, and "chuck" mouth sound) just took off.

There were spills and leaks, and nobody cleans it up. Nobody says anything or does anything. There's no oversight. The state doesn't come out and say, "You gotta clean [wry laughter] this up."

It's left to the people who are living there.

The blowout happened August 11, 2006.

They hit their target depth and hit a really high pressure pocket, reservoir of gas. The well kicked back.

Text overlay:
DEQ Wyoming Department
of Environmental Quality

And in the early afternoon they started seeing these blowholes pushing all those drilling fluids and condensate up to the surface. So it looked like the mud pots in Yellowstone Park.

They finally figured out that they couldn't control the well so they tried to evacuate everybody in the drainage.

LOOKING BACK, DEB TOOK THIS PHOTO AS SHE WAS BEING EVACUATED.

Surface water shots:

Deb:
They knew that all of those chemicals in the drilling fluids and the condensates had come up through the water in the drainage, and as a result what's happened is all of the groundwater was contaminated. Now we have huge groundwater contamination.

Most people recognize water contamination before they recognize air, and there was nothing in place by the state to monitor the air.

Heat haze from vents and chimneys:

But we started to recognize that there were all these emissions coming from production fields, from tanks, from separator equipment, from everything they were venting, and so we were smelling it.

And so we started asking the state to monitor it, and of course they wouldn't. They didn't have any money to do it.

And so we decided to do it ourselves.

Denny Larson:
Breathing is something you do every minute of every day hopefully [laughs] until you're dead.

So, um, from the very beginning it was a right to know issue…

L3
Denny Larson
Founder, Bucket Brigade

…and still is. People wanted to know what they were breathing. [laughs] Y'know… It's pretty basic. It's not an optional thing that you do.

Deb at work and Denny continues VO:

Deb contacted us. She was aware of the Bucket Brigade because work had been done in that area.

She was trying to figure out for a long time whether to just, kind of, give up. She was pretty burned out.

Deb driving:

And she seized upon this idea that if she could do a Bucket Brigade to show the presence of these chemicals that were in the bag that they could actually make some change in Wyoming, which is no small task.

CGI cover of WARNING SIGNS report:

Deb:
At that point he was just starting the five state, turned into a six state study, on air quality around fracking sites. And he said, "Well, if you want to do Wyoming you can do it."

So we started the Bucket Brigade and doing our own air monitoring.

Scenes of Deb at the fracking site, working with the Bucket.

Denny:
The first thing that happens is the sites are selected. The citizen scientists are trained onsite by ourselves. They've got a set number of samples that they can take. So the samples are taken, literally taking a plastic bucket and putting some stainless steel on it that will hold the sample bag.

It's like a lung. So the bucket is the body, the bag is the lung, and then there's a pump which serves as your diaphragm which pumps the air out creating negative pressure opening the bag and bringing in air, so it can be sealed and sent to the lab for testing. And they process it immediately.

BUCKET BRIGADE TECHNIQUES HAVE BEEN REVIEWED BY THE EPA AND HAVE BEEN FOUND TO BE USEFUL IN CAPTURING DATA WHERE GOVERNMENT SENSORS ARE LACKING.

Denny:
The "Warning Signs" study looked at hazardous air pollution in five states. It's the whole infrastructure that we went after at every point.

We ran around taking bucket samples. We took many samples at well pads. Then it moves along a pipeline where there are sometimes vents into compressor stations.

The compressor station has got to move again to the gas processing plant where it's made into, y'know, the natural gas that's sold.

CGI of report details about the testing lab:

SAMPLES WERE ANALYZED USING EPA PROTOCOLS BY A CALIFORNIA LABORATORY WHICH IS CERTIFIED BY TEN STATES AND THE U.S. DEPARTMENT OF DEFENSE.

CGI emphasizes certain chemicals:

David:
Of the samples that we took, they were analyzed for the volatile organics, which includes methane, benzene, ethylbenzene, hexzane, xylene, a whole variety of things.

Scenes of him at computer, in the chemical closet, etc.

DAVID CARPENTER IS A PHYSICIAN AND DIRECTOR OF THE UNIVERSITY AT ALBANY'S INSTITUTE FOR HEALTH AND THE ENVIRONMENT.

FOR 15 YEARS HE HEADED NEW YORK STATE'S PUBLIC HEALTH REFERENCE LABORATORY.

David:
Basically what we found is that 60 percent of the samples did not exceed any federal guideline. But that is to say 40 percent of them did.

Deb:
I was shocked. I didn't think we'd find much. And we found emissions off the freaking charts.

David:
We found that many of the samples exceeded those standards.

CGI emphasizes benzene:

Some for benzene were something like 10,000 times above the standard.

CGI with details from the report:

Denny:
Many of the toxic chemicals that are known to cause cancer that we found in this report were in some cases hundreds, in other cases thousands, and in one case 22 million times over the EPA cancer risk.

David:
These are enormous releases. Many of these compounds are neurotoxins. At high concentrations they can actually cause coma, but at lower concentrations they tend to reduce brain functions.

Pan over fracking site:

The long term effects, the biggest one is cancer because several of these are known human carcinogens.

Deb:
So when we started doing the Bucket Brigade, the five, six-state Bucket Brigade, we didn't intend on doing the peer-reviewed article. We were just going to do the report.

Pan of David's lab and office:

David:
I became involved in the fracking study when the groups that had coordinated the community-based activities approached me for assistance doing the statistical analysis of the data, writing up the publication, and getting it published in a peer-reviewed journal.

And whenever there is this kind of study having a peer-reviewed publication is sort of the "Good Housekeeping" seal of legitimacy for a study.

Environmental Health article and diagrams as CGI:

Deb:
What happens with citizen science is everybody disses it. So the peer-reviewed article was extremely important because it gave validity to citizen science.

Denny:
I think that's why we got taken *so* seriously that a journal article had been published and this is what academics, scientists and doctors were saying about the extreme hazard from oil and gas development.

National Geographic, US News & World Report, and ProPublica headlines: CGI"

And there was widespread coverage across the U.S. and actually globally of both the peer-reviewed study and the report, and it had a major impact.

Deb:
I think the greatest influence from the "Warning Signs" report was for the ban in New York.

Acting Health commissioner Zucker and page from New York Times:

David:
Our fracking study was waved by the Commissioner of Health when he made the announcement that the governor of New York was banning fracking.

Waleed to camera:
Industry-related groups *did* question the objectivity of the peer reviewers.

But those reviewers were independently selected by the journal editors, not the authors.

And there have been no questions about the factual accuracy of the laboratory analyses.

Deb:
When you start watching your family get sick, when your kid has a bloody nose for weeks on end and you can't figure out why… Yeah, it changes your whole perspective on fossil fuels development.

I was so pissed off over what was happening to us. I couldn't believe it. I couldn't believe that our government wasn't there to help us, that there was nobody that would do anything about what was happening to us.

And if had a nickel for every time somebody said, "Oh, they can't do that. You just have it wrong," I would be a millionaire, because *nobody* can believe it. Until you live through this you can't believe it.

Denny:
I mean, that's something in this line of work you hear just about every day, because people who live on the fence line are totally marginalized. It's a very small percentage of the total population, but they're essentially in a sacrifice zone. And people want their gasoline, and they want it cheap. And they want their products, and they want it cheap. And there are people that pay for that at the fence line.

Waleed beside a car, smartphone in hand:
Most of us drive. Many of us fly. And just about all of us rely on internet and social media, using energy intensive servers to keep in touch.

So the question is, how do we generate the energy we need while still ensuring there are protections in place for innocent citizens, and that someone is enforcing the laws fairly.

Deb:
One thing you have to keep in mind is that the oil and gas industry has exemptions to the Clean Water Act, Safe Drinking Water Act, and the Clean Air Act.

Denny:
Y'know, if you live next to a factory, that factory has to follow federal laws to keep them from poisoning your drinking water, groundwater, air, from poisoning the soil, from poisoning the bay or river that they dump their discharge into. You're protected with that factory.

When the oil well or the fracked gas comes in your backyard you don't have that.

Deb:
This isn't going to end anytime soon until people just refuse to put up with it.

I say kudos for places like New York who, y'know, have been able to say, "No, we don't want it," but that's becoming more and more difficult.

CGI of journal article conclusions:

Open captions:
community-based monitoring
extend the reach
limited public resources.

THE "ENVIRONMENTAL HEALTH LETTERS" ARTICLE CONCLUDED THAT "COMMUNITY-BASED MONITORING CAN EXTEND THE REACH OF LIMITED PUBLIC RESOURCES."

Denny:
I mean, if somebody doesn't have the right to know what they're breathing, I don't know that it is… how it could be more of a human rights issue than that.

Right now without the citizen science movement around oil and gas development, for example, there's no new information.

(Music swells)

Deb:
People ask my husband, Dick, and me this question all the time. "Why do we stay?" "Why don't you just leave?"

Aerial:

I believe it's our responsibility to protect what we have for future generations.

My family's been on the Front, the Beartooth Front, for four generations, and I feel like I'm here to protect as much of it as I can.

Deb on camera:
I owe that to my children, and their children, to all the animals that live here with us, and to my ancestors.

Dip to black and a moody timelapse sky: URL over:

CGI URL:
CrowdAndCloud/AirQuality

3: TROUT UNLIMITED

Waleed to camera:

Protecting nature sometimes takes heroic efforts and personal courage. But thanks to new sensors and new groups understanding the value of science-based observations, protecting the environment is something all of us can do, while pursuing our passions.

"Trout Unlimited"
Fishing for Data

(Music)

Jim Weaver:
I've been fly fishing since I was in high school. I always joke that if catching fish was the object, I'd change my tactics.

I don't care if I catch a fish or not, the opportunity to get out and get immersed in the water, and be in nature.

Humans are part of nature, not separate from it.

JIM WEAVER HAS BEEN FLY-FISHING FOR OVER 40 YEARS IN THE STREAMS AND RIVERS OF TIOGA COUNTY, IN NORTH CENTRAL PENNSYLVANIA.

Country and city scenes:

(Music)

Lori Maloney
If you're somebody driving around Tioga County for the first time…

L3
Lori Maloney
Watershed Specialist
Tioga County Conservation District

…you're likely to notice, first, long winding roads that go through the countryside, that eventually end up at the tops of hills inside of these beautiful, dense hemlock forests that feed coldwater streams that eventually run into rivers.

Jake Lemon
The communities are primarily established in the valleys…

L3
Jake Lemon
Eastern Shale Gas Monitoring Coordinator
Trout Unlimited

…and the valleys also happen to be where the rivers are. And so, every community has a creek or a river running right through it, so it's really a part of the lifeblood of the area.

BUT OVER THE LAST DECADE, JIM AND HIS FISHING FRIENDS HAVE SEEN A LOT OF CHANGES.

Lori:
About seven or eight years ago, the gas industry started to move into our region, and this brought new opportunities, but it also brought a lot of new changes, and so it caused concern for some of our local citizens.

USA and Marcellus map:

NORTHERN PENNSYLVANIA SITS ON TOP OF THE RESOURCE-RICH MARCELLUS SHALE.

THE MARCELLUS REGION ALONE ACCOUNTS FOR ABOUT FORTY PER CENT OF U.S. SHALE GAS PRODUCTION

L3
Bob Volkmar
Volunteer, Trout Unlimited

Bob:
Back in 2008, we became aware of this whole Marcellus Shale natural gas play, and we recognized that, that there's some risks there, to our coldwater streams.

Waleed, wading in South Boulder Creek:
Local government realized it didn't have enough boots on the ground, or waders in the stream, to monitor every river.

Bob:
Shortly after that, Tioga County Conservation District started a citizens' stream monitoring program and they invited a number of us from a neighboring Trout Unlimited chapter to come over and go through the training, and learn what this was all about.

Training meeting:

Bob:
Afterwards, we got to talking that "Boy, this is right up our alley." I mean, who's on the streams more than we are?

"TROUT UNLIMITED" STARTED AS A CONSERVATION ORGANIZATION OVER 50 YEARS AGO, WITH 16 FISHERMEN WHO WANTED TO PROTECT AND PRESERVE THE WATERS THEY USED.

CGI, with TU members from many states:

NOW IT'S A NATIONAL ORGANIZATION WITH SOME ONE HUNDRED AND FIFTY THOUSAND MEMBERS IN ALMOST EVERY STATE.

Jake:
A lot of the shale gas development was happening in very remote regions of Central Appalachia, and it just happened to overlap with some of the best wild and native trout watersheds that we have out here.

So we thought it was imperative upon us to get out and collect good data, so that we could see, y'know, if any pollution events were occurring, and to keep an eye on things.

TU volunteer:
"49.8 degrees Fahrenheit."

Barb St. John White:
It's really a diverse group. We have retirees who collect data in the streams where they go to trout fish, their favorite trout fishing streams.

L3:
Barb St. John White
Coordinator, Trout Unlimited

Other folks who monitor in the streams close to home, that they just have that connection to, because it's their home watershed.

Jake:
Anglers know their home waters, they know how they should look at certain periods of the year, and so they are best suited to identify potential pollution events that could occur.

Barb:
Some parents like myself who want to include their kids in this kind of an experience. And then, you know, we have a high school student who wants to learn more about science who is looking to get involved in science down the road.

Natalie and Barb doing stream monitoring work, including some in-the-field interviews:

Natalie Mee:
Today we're here at Darling Run. We're taking measurements of conductivity, pH, and temperature…

L3
Natalie Mee
Volunteer, Pine Creek Waterdogs

When I heard about the Marcellus gas industry, I was really concerned and I wanted to find a way that I can help out, and this is a way that I found I could do it.

I monitor once a month, and it takes me about an hour to do it. I have three different locations that I monitor that are near my house. So, these are streams that I really care about.

Shots of first set of volunteers, collecting data in Pine Creek:

Katy Dunlap:
So TU's volunteer monitoring program really starts with TU's staff training our volunteers.

L3
Katy Dunlap
Fmr. Director, Eastern Water Project
Trout Unlimited

Once those volunteers are trained, depending upon where they live and how much shale gas development is occurring near their watersheds, they will go out and monitor either on a bi-weekly basis or once a month.

And they will spend about 15 to 20 minutes at each site taking key water quality parameters that will let us know if shale gas development is affecting the streams.

TU stills, with camera sounds:

A FEW YEARS BACK, ONE "TROUT UNLIMITED" VOLUNTEER WAS OUT FISHING, AND SAW SOMETHING DIFFERENT AND DISTURBING ABOUT THE WATER.

Katy:
He noticed a turbid plume of dirty, brown, muddy water coming down the stream.

TU stills, with camera sounds:

He followed that plume upstream, and continued to follow it through a different tributary until eventually he found the source.

He immediately contacted the county conservation district which conducted an inspection, issued violations.

TU stills, with camera sounds:

And then that agency brought in state agencies who ultimately initiated an enforcement action, which was finally settled just last year for $800,000.

SO FAR, TU'S "ANGLER SCIENCE" HASN'T RECORDED ANOTHER SIMILAR SPILL… OR TRIGGERED ANOTHER SUBSTANTIAL FINE.

BUT THEY KNOW THEIR WORK IS VALUABLE NONETHELESS BECAUSE THEY'RE DOCUMENTING THE PRESENTLY UNSPOILED CONDITIONS.

Jake Lemon:
We're hoping that with the extensive monitoring that we've been doing, should there be another large-scale boom in the area, we'll have adequate baseline data to really compare against our post-development data to see if there are changes.

Volunteer, Rhonda Keller:
We want the industry to know we're out there looking.

TU'S CITIZEN SCIENCE DATA IS RELIABLE ENOUGH TO BE TRUSTED BY GOVERNMENT RESEARCHERS *AND* ACADEMIC SCIENTISTS.

CGI showing who is using the data:

Jake Lemon:
We've had various agencies and institutions reach out to us to get a hold of our data set and use it in their research.

They see value in volunteered data. It's a great resource of large data sets that they couldn't collect with their professional staff alone.

Art Antal:
You don't have to be a scientist to put a thermometer in the water.

L3:
Art Antal
Volunteer, Trout Unlimited

A lot of the technology now makes it very easy to collect very accurate scientific data.

Jere catching a fish:

Jim Weaver, VO:
Brook trout is a canary in the coal mine because they're very sensitive to changes in their habitat. They're coldwater fish. They're sensitive to sediment, and so when you've lose the brook trout, you've lost the quality of that habitat.

Lori VO:
Once you lose that, it's really hard to get it back.

THE OIL AND GAS INDUSTRY IS ALWAYS SUBJECT TO BOOM AND BUST CYCLES. BUT WHATEVER THE FUTURE BRINGS, CONTINUED MONITORING OF SUCH PRICELESS NATURAL ASSETS IS A WISE INVESTMENT OF TIME AND EFFORT.

Jim Weaver:
It's like Cousteau said, "people protect what they love."

(Music swells)

CGI URL:
CrowdAndCloud.org/WaterQuality

4: MA JUN AND IPE

Waleed to camera:
Citizens pushing for more transparency, holding local authorities to account.

That may not seem unusual in Europe or the United States… and thanks to the efforts of one man and the crowd, it's also happening in China.

Where increasingly the battle for blue skies and clean streams is being waged online, via social media.

The
"Black & Smelly Rivers"
app

Ma Jun traveling across China in winter clothing: scenes of obvious air and water pollution:

Ma Jun VO:
I got the chance to travel in different parts of China in the mid-1990s and I was struck by the environmental damage, especially the degradation of our water resources, of the rivers and lakes.

So I realized that a major eco-damage is going on and so I put it into a book titled “China’s Water Crisis.”

And many people, they came back and say that y’know we agree, but what should we do, how should we try to solve this problem?

L3:
Ma Jun
Institute of Public and Environmental Affairs, IPE

So all these years I’ve been pushed into thinking about solutions.

Polluted city shots:

RECENT STUDIES INDICATE THAT SOME ONE POINT SIX MILLION CHINESE DIE EACH YEAR FROM AIR POLLUTION.

AND THE OVERALL COST OF POLLUTION TO CHINA IS ESTIMATED AT AROUND TEN PER CENT OF ITS 11 TRILLION DOLLAR ECONOMY.

CU Ma looking. Countryside from car trip and train:

In the countryside we still got up to three hundred million rural residents who still lack access to safe drinking water. That can also lead to bad health problems.

Xintiandi, Shanghai, and other development shots:

China has been through this 30 years of tremendous economic growth, that benefit China but it put huge pressure on the environment.

And in the meantime China has spent huge efforts to try to deal with the problem during the past ten years.

Meeting of the People’s Congress, Beijing:

The government have changed policies and strategies and tried to integrate environmental targets into the economic development plan.

Ma on camera:
However we still haven’t seen the turning point.

See polluting factories and environmental issues: we can use Skoll footage, or anything from ETOM.

Waleed VO:
IN A MOVE THAT MIGHT SURPRISE SOME, CHINA’S CENTRAL GOVERNMENT HAS REQUIRED MAJOR FACTORIES TO INSTALL AUTOMATIC SENSORS TO DOCUMENT EMISSIONS.

PEGGY LIU IS A CHINESE AMERICAN WHO HEADS UP JUCCCE, THE JOINT US-CHINA COLLABORATION ON CLEAN ENERGY.

L3:
Peggy Liu
Chair, JUCCCE

Peggy Liu:
So, in 2015, they launched the new Environmental Protection Law which allows whistle blowers to actually get money, and encourages them to actually identify which point sources of emissions there are, and it also allows NGOs and other organizations to sue these factories for too much pollution.

IPE office scenes, seeing Ma Jun meeting with staff:

MA JUN SET UP ONE OF CHINA'S FIRST NGO'S – THE INSTITUTE OF PUBLIC AND ENVIRONMENTAL AFFAIRS, TO SHARE THAT DATA WIDELY.

Screen shots of IPE's first generation Pollution Map:
IPE'S FIRST ONLINE PROJECT WAS TO DEVELOP A NATIONAL POLLUTION MAP SO ORDINARY CITIZENS COULD ACCESS WATER QUALITY DATA AND SEE A LIST OF POLLUTERS.

Ma Jun and others at the discharge site/factory inspection:

FACTORIES DYEING FABRICS FOR THE TEXTILE INDUSTRY HAVE BEEN A MAJOR SOURCE OF DISCHARGE INTO THE RIVERS AND THE OCEAN.

Action shots and short English language snippets from Ma at the beach.

Ma Jun, on location:
We can see from the color that it cannot meet with the standards. You can feel the heat from it.

SOME FACTORIES ARE TAKING STEPS TO IMPROVE.

OTHERS TRY TO HIDE THEIR POLLUTION BY DISCHARGING IT FARTHER OUT INTO THE RIVERS.

Ma runs down the pier:

Open captions for Chinese language remarks:

There are three discharging points.
One, two, three.

There's another under the bridge.

There are more than three, there are many.

Ma walks along the dyke and comes across a worker in the yellow hard hat:

Subtitled Ma and Chinese worker:

Ma Jun:
Where does the pipe go? Over there?

Worker:
If I tell you, I'll be punished!

Ma and colleagues drive up to the Saintyear factory and then into the building:

MA JUN AND IPE ASSEMBLED A GROUP OF CHINESE ENVIRONMENTAL NGO'S INTO A "GREEN CHOICE ALLIANCE" TO PRESSURE LOCAL FACTORIES INTO COMPLIANCE.

ONE POLLUTER WAS THE SAINTYEAR TEXTILE GROUP. BUT AFTER WORKING WITH IPE, THEY CHANGED THEIR PRACTICES AND CLEANED UP THEIR DISCHARGES.

Open caption:
This action is actually good news for companies like us who are doing a good job in environmental field.

Ma Jun:
The most important is to make sure that those who don't want to comply with the basic standards will be properly penalized.

Ma on camera:
So you need to have the stick.

MA JUN REALIZED THAT IPE'S MAPS AND DATA COULD ALSO BE USED TO PRESSURE INTERNATIONAL *BRANDS* INTO INSISTING ON CHANGE.

Anna Walker, Levis, B-roll and to camera:

Anna Walker:

Well, I think they epitomize the Margaret Mead quote about a small group of citizens changing the world.

L3:
Anna Walker
Sr. Director, Government Affairs & Public Policy
Levi Strauss & Co.

It's incredibly striking to me, not only in the apparel but in the electronics sector, that without their action I don't think that we would see the efforts both on the brands, and the apparel industry side, but on the suppliers and manufacturers in China.

BUT FOR ALL OF IPE'S SUCCESSES WITH THE "GREEN CHOICE ALLIANCE," MA JUN KNEW MUCH MORE NEEDED TO BE DONE.

Ma Jun:
We revealed the situation and what we found is that it's just a drop of water in the bucket.

We still got probably 140,000 records of violations and most of the factories still wouldn't try to respond, and try to solve their problem.

So we believe we need to scale up our work. And the way to do that is to expand transparency in a vast way.

THE SAME FRANTIC PACE OF ECONOMIC DEVELOPMENT THAT GENERATED SO MUCH POLLUTION ALSO LED TO THE INTERNET AND MOBILE PHONES BECOMING UBIQUITOUS ACROSS CHINA.

See Zou Yi walking into his tenement, taking the elevator, going up into his room and taking photos.

ZOU YI AT FIRST WAS JUST AN INDIVIDUAL SICKENED BY SEEING THE POLLUTION OUTSIDE HIS BEIJING APARTMENT.

HE STARTED TAKING PHOTOS EVERY DAY, DOCUMENTING BLUE SKIES AND THE EVER-MORE FREQUENT BROWN SKIES.

SOON HE WAS FOLLOWED BY MORE THAN TWENTY FOUR MILLION PEOPLE ONLINE!

Zou Yi:
This is the whole year of last year in pictures.

So from here you can see how many blue skies we have and the smog days we have.

You don't need any more message or expressions.

Men and women on street scenes, using mobiles:

Ma Jun:
I believe that we need to take advantage of this quick development of mobile internet and try to help people to access the data through a cell phone application.

Ma Jun on camera and screen shots of the app:

IN 2016, VERSION 3.1 OF IPE'S "BLUE MAP" APP WAS RELEASED, TAKING ADVANTAGE OF THE EXPLOSION OF APPS LIKE WECHAT AND SINA WEIBO CHINA'S TWITTER.

ONE SPECIAL SECTION OF THE APP IS CALLED "BLACK AND SMELLY RIVERS."

Ma Jun demos the app:
This is the first time for people to be able to check about the quality of the rivers and lakes in their areas on their cell phone.

Peggy walks in on the rooftop and uses the app:

Peggy Liu:
Today, when you have a platform like WeChat, which is our most prolific social media platform—it has over 550 million active users each day—anybody can identify red-colored waters.

All of this can immediately create unwanted exposure for companies, as well as cities.

Ma Jun:
People can share this data on the platform created by the Ministry of Environmental Protection and the Ministry of Housing and Construction.

It's quite happy to see that all this has some official response.

CGI translates some of the Chinese language text:

The red color response is from the government agencies that all this pollution problem did exist.

"So we will try to tackle this problem."

Peggy Liu:
What the Blue Map app does, is it combines the government data, as well as the user-generated content, on what's happening with air pollution and water pollution, into one easy-to-use platform. And that will make a lot of NGO's works, local environmental courts' works, much easier.

Ma Jun:
Of course, we are not just trying to help people access the air and water quality. They need to know who are the source of all this pollution so that they can get involved. With this idea we help people to access the data on the emitters.

This is for air pollution in different parts of China.
Those which are in red meaning that they are not in compliance with the standards. They can use the app to share the data through social media which helps to motivate more than 600 major violators to openly address their problem.

Peggy:
All of these social media platforms have really revolutionized environmental enforcement and monitoring.

And now individuals are incentivized up to RMB 5,000, or almost $1,000 US, to identify polluting companies.

Ma Jun:
We are happy to see in some of the areas which used to have so many red dots and now, y'know, many of the violators have turned from red into green.

Ma walking across the rocks at the discharge site:

MA JUN AND IPE HAVE MANAGED TO MAINTAIN THEIR TRICKY BALANCE BETWEEN THE GOVERNMENT AND THE PUBLIC, AND CONTINUE THEIR WORK FOR ACCOUNTABILITY AND TRANSPARENCY.

Peggy:
The Blue Map app is really revolutionary for China. In this point of history in China, it's sorely needed.

Ma Jun:
Our mission is to try to find back the blue sky and clear water for the public.

URL CGI over blue sky scenes from Beijing:

CrowdAndCloud.org/BlueMapApp

5. WRAP

Transparency, Accountability
Empowerment

(Music)

PROBLEMS WITH AIR AND WATER POLLUTION ARE LONG-STANDING AND TAKE TIME TO FIX.

THE BLOWOUT THAT MOTIVATED DEB THOMAS TO GET INVOLVED WITH BUCKET BRIGADE MONITORING HAPPENED IN 2006.

BY EARLY 2016, 10 YEARS LATER, MILLIONS OF DOLLARS HAD BEEN SPENT TO TRACK THE SPILL BUT THE POLLUTION HAD STILL NOT BEEN FULLY REMEDIATED.

AT THE SAME TIME THE FRACKING COMPANY WAS PETITIONING THE STATE TO CLOSE OUT THE CASE.

AND IN MANY WAYS, CITIZEN MONITORING IN WYOMING HAS RECENTLY BECOME MORE DIFFICULT.

Deb Thomas:
One of the problems in Wyoming is that this last year they passed a trespass law which stops citizens from collecting resource data. And so the kind of data collection that we did cannot be done in Wyoming. So now even though the state won't collect that data for you, you no longer can. We have to live with it and shut up.

Denny Larson:
You have to have hope in this line of business because there's a lot of negative things that are happening out there to a lot of really good people who don't deserve it.

But I'm hopeful for the future because I see a mass movement of people using citizen science and people who support them rising up to say, "This will not continue. This will change."

And there's a very diverse group of people, including conservatives, that are joining together. And there's a lot of hope in that.

Ma Jun
We are the first group who try to focus on transparency and use that as a tool to empower the citizens, so they can get involved.

WHILE "PHILLY UNLEADED" FOUND LOW LEVELS OF LEAD IN MANY OF THE SAMPLES TESTED, ANY AMOUNT OF LEAD IS NOW CONSIDERED DANGEROUS… BUT, IF CITIZENS AND SCIENTISTS AND PUBLIC HEALTH AGENCIES ALL WORK TOGETHER, THERE ARE SOLUTIONS.

Marc Edwards:
Really there's no more powerful scientific force on this planet than a mother trying to figure out why their child is sick. These moms have been extraordinarily good scientists.

Myra Young:

I feel good to be able to speak out for my children's future. They are my future.

Waleed to camera:
In my work as a researcher, I use satellites and supercomputers to see how the Earth is changing. But there's no way satellites can look inside lead pipes or capture stream quality data on all our rivers.

That's where citizen science provides ground-truth, and where all those volunteer hours pay off in local knowledge that's invaluable. It's a win-win for citizens and scientists.

For THE CROWD & THE CLOUD, I'm Waleed Abdalati.

Web announcement, voice and on-screen text:

To learn more about
THE CROWD & THE CLOUD and the stories in this series please visit CrowdAndCloud.org

End credits:

Underwriter announce:

"THE CROWD & THE CLOUD" is made possible by NSF, the National Science Foundation, Where Discoveries Begin."