BENEFITS FOR HUMANITY:
EYE ON THE TIDE

1
00:00:01,434 --> 00:00:10,476
Carroll Township's
a very rural area

2
00:00:16,115 --> 00:00:18,150
in northern Ohio
right on Lake Erie.

3
00:00:18,150 --> 00:00:20,586
Lake Erie's always
been very important

4
00:00:20,586 --> 00:00:22,455
to Carroll Township
and its residents.

5
00:00:22,455 --> 00:00:25,257
We use it for drinking
water, we treat it,

6
00:00:25,257 --> 00:00:32,798
and it's really our livelihood.

7
00:00:37,837 --> 00:00:41,273
Lake Erie, for what
unknown reason,

8
00:00:41,273 --> 00:00:43,843
suddenly the toxin level
spiked and that got

9
00:00:43,843 --> 00:00:46,579
through the treatment system.

10
00:00:46,579 --> 00:00:49,849
It was indicated to me that
it is pretty dangerous.

11
00:00:49,849 --> 00:00:54,854

Cyanotoxins can cause skin
rashes, headache, nausea,

12
00:00:54,854 --> 00:00:58,424
vomiting, stomach problems,
nervous system problems,

13
00:00:58,424 --> 00:01:01,694
liver damage to death.

14
00:01:01,694 --> 00:01:04,697
We sampled and we had about
two and a half times the limit

15
00:01:04,697 --> 00:01:07,133
from the World Health
Organization.

16
00:01:07,133 --> 00:01:10,669
The second sample was
approximately 3.5 times.

17
00:01:10,669 --> 00:01:12,238
Our plant wasn't set

18
00:01:12,238 --> 00:01:14,773
up to handle what was
coming in from Lake Erie.

19
00:01:14,773 --> 00:01:17,643
One of my biggest worries
was actually hurting someone

20
00:01:17,643 --> 00:01:19,879
or even worse.

21
00:01:19,879 --> 00:01:22,548
So we shut it off right
away, shut everything off.

22
00:01:22,548 --> 00:01:24,783
We had a very close
call that day.

23
00:01:24,783 --> 00:01:29,488
The last thing you want to
do is produce an unsafe water

24
00:01:29,488 --> 00:01:32,791
and allow your people
to drink it.

25
00:01:32,791 --> 00:01:35,294
What we need is a
better way to track

26
00:01:35,294 --> 00:01:39,665
and predict these cyanobacteria
entries from our source water

27
00:01:39,665 --> 00:01:48,207
so that we can make sure that
this never happens again.

28
00:01:48,207 --> 00:01:51,310
A lot of times we'll
find out after the fact

29
00:01:51,310 --> 00:01:53,646
that there's a problem with
cyanobacteria in the water

30
00:01:53,646 --> 00:01:55,714
because the blooms
already occur.

31
00:01:55,714 --> 00:01:59,351
We either get results of
sick animals or sick people.

32
00:01:59,351 --> 00:02:00,619
We need a paradigm shift.

33
00:02:00,619 --> 00:02:03,689
We need to go from being
constantly reactive

34
00:02:03,689 --> 00:02:07,393
to these blooms too having
a capability that allows us

35
00:02:07,393 --> 00:02:11,330
to become proactive, and the US
Environmental Protection Agency

36
00:02:11,330 --> 00:02:14,366
has been very encouraging of
allowing for some high-risk,

37
00:02:14,366 --> 00:02:16,969
high-reward projects
and that allowed us

38
00:02:16,969 --> 00:02:20,906
to think outside the box
- way outside the box.

39
00:02:23,375 --> 00:02:25,711
We've been fortunate enough
to make use of a sensor

40
00:02:25,711 --> 00:02:28,480
on the International Space
Station call HICO, which stands

41
00:02:28,480 --> 00:02:31,550
for the Hyperspectral Imager
for the Coastal Ocean.

42

00:02:31,550 --> 00:02:35,221
HICO consists of two
instruments, one is a camera,

43
00:02:35,221 --> 00:02:38,857
and the second instrument
is a spectrophotometer,

44
00:02:38,857 --> 00:02:41,327
which actually gives
us the spectrum

45
00:02:41,327 --> 00:02:43,295
of light leaving that water.

46
00:02:43,295 --> 00:02:45,531
The camera on a cell
phone for example contains

47
00:02:45,531 --> 00:02:47,666
about three bands and
data in a red channel,

48
00:02:47,666 --> 00:02:51,036
a green channel and
a blue channel.

49
00:02:51,036 --> 00:02:55,441
HICO gathers light from the red,
orange, yellow, green, blue,

50
00:02:55,441 --> 00:02:58,043
indigo, and violet
part spectrum.

51
00:02:58,043 --> 00:03:00,913
So using this technology
we were able

52
00:03:00,913 --> 00:03:03,916

to now detect those
water quality parameters

53
00:03:03,916 --> 00:03:08,254
such as water clarity, what the
phytoplankton concentration is

54
00:03:08,254 --> 00:03:11,257
your water, how much light is
being absorbed in your water,

55
00:03:11,257 --> 00:03:14,994
as well as what's the
distribution of cyanobacteria

56
00:03:14,994 --> 00:03:16,729
in those waters, and does

57
00:03:16,729 --> 00:03:18,631
that concentration
pose a health hazard.

58
00:03:18,631 --> 00:03:22,468
So what this means is instead
of waiting for someone to report

59
00:03:22,468 --> 00:03:25,004
that there's a problem
with cyanobacteria blooms,

60
00:03:25,004 --> 00:03:27,973
we can monitor these
water bodies from space,

61
00:03:27,973 --> 00:03:30,476
and get information
that we can rapidly get

62
00:03:30,476 --> 00:03:32,945
out to the water

quality managers

63
00:03:32,945 --> 00:03:38,384
through a smartphone application
that we've developed.

64
00:03:38,384 --> 00:03:40,386
So the app allows you
to drop to pinpoint,

65
00:03:40,386 --> 00:03:42,721
and that pin can be
placed in an area

66
00:03:42,721 --> 00:03:45,557
where drinking water treatment
plant may have an intake,

67
00:03:45,557 --> 00:03:48,093
and see what the current
water quality conditions were.

68
00:03:48,093 --> 00:03:50,729
Each user gets that
information near real time,

69
00:03:50,729 --> 00:03:53,766
so they can make judgment
calls on whether they have

70
00:03:53,766 --> 00:03:56,502
to respond or take action.

71
00:03:56,502 --> 00:03:58,003
Having the HICO

72
00:03:58,003 --> 00:04:01,707
on the International Space
Station has been the ideal test

73
00:04:01,707 --> 00:04:04,410
bed for our research.

74
00:04:04,410 --> 00:04:05,744
This is an amazing partnership.

75
00:04:05,744 --> 00:04:09,381
The Naval Research
Laboratory had HICO

76
00:04:09,381 --> 00:04:11,884
on NASA's International
Space Station.

77
00:04:11,884 --> 00:04:14,586
As HICO acquired a
scene, it was transferred

78
00:04:14,586 --> 00:04:16,021
to the Naval Research
Laboratory,

79
00:04:16,021 --> 00:04:18,957
and then the Environmental
Protection Agency was able

80
00:04:18,957 --> 00:04:20,626
to do the analysis
and validation

81
00:04:20,626 --> 00:04:22,661
to send this information

82
00:04:22,661 --> 00:04:25,931
out through a prototype
mobile application.

83
00:04:27,132 --> 00:04:29,535
Yes, this technology

will reduce costs

84
00:04:29,535 --> 00:04:32,037
and provide near
real-time information.

85
00:04:32,037 --> 00:04:35,407
But the big goal here
is protecting humans