



Team 3

**Hack the GLOBETROTTERS**

# Meet Anna the Analyst & Frank the Firefighter...



Red Cross Data  
Analyst

Committed to  
providing positive  
impact via natural  
disaster response  
strategy

Industrial Engineer

Local firefighter

Wants to relieve  
suffering of those  
affected by  
increasing  
disaster events

EMT



# The current **disaster response** process is **lacking**



- Spends time coordinating disparate data
- Data governance is low
- Contributes less time to building response strategy

- Lack of direction in his response actions
- Lack of support from coordinating organizations



**End result: great people, feeling frustrated**

The current **disaster response** process is **lacking**

**What is the  
solution?**



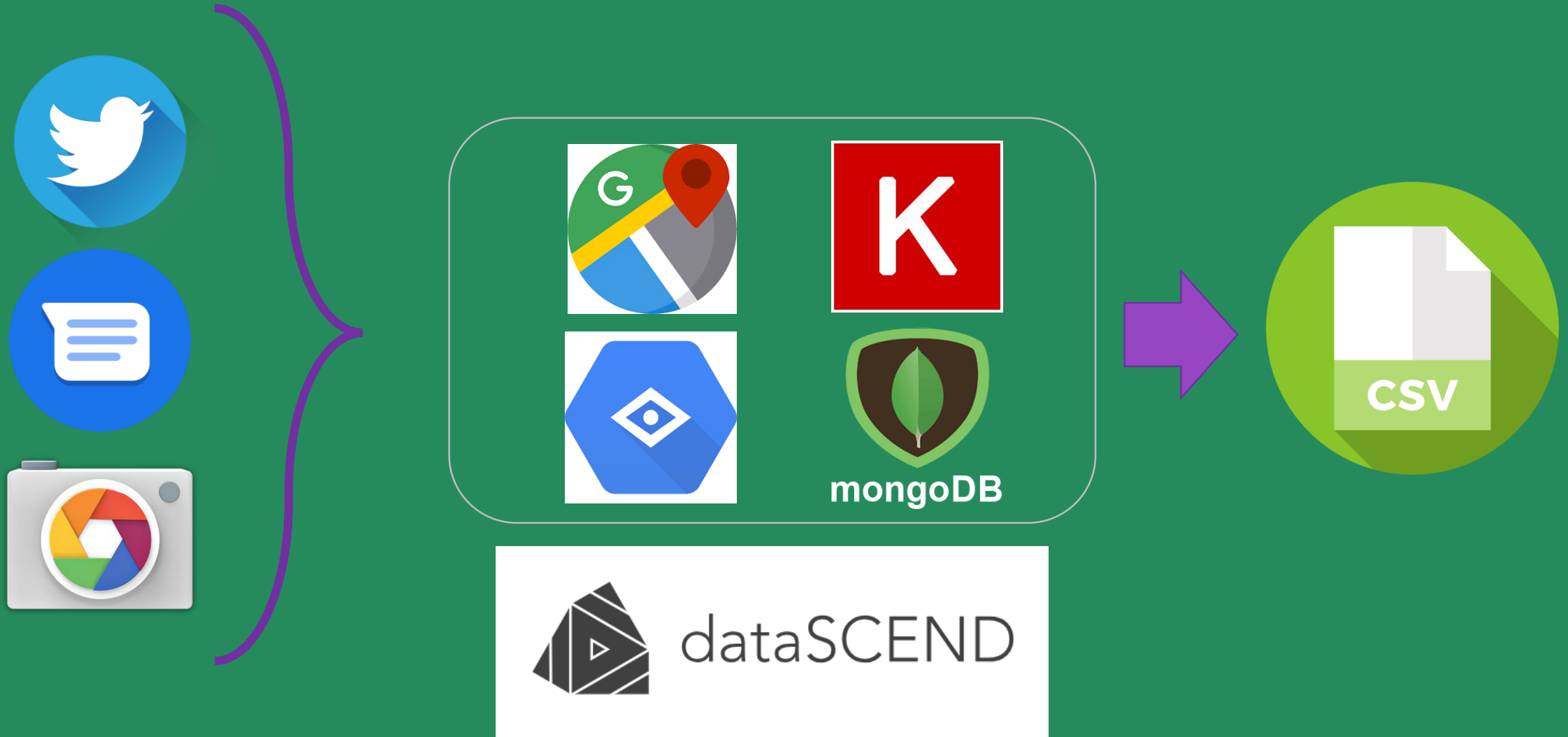
# The current **disaster response** process is **lacking**



dataSCEND



# Realtime homogeneity of non-traditional disparate data



# Making apple juice from different coloured apples



# Let's talk about the 2016 Fort McMurray Fire

Response bodies did not conform to the same communication channels

- Data governance and integrity was poor
- Lack of consistent communication methods
- **Social Media was a primary source of insight**





# How could it have been different with



Input

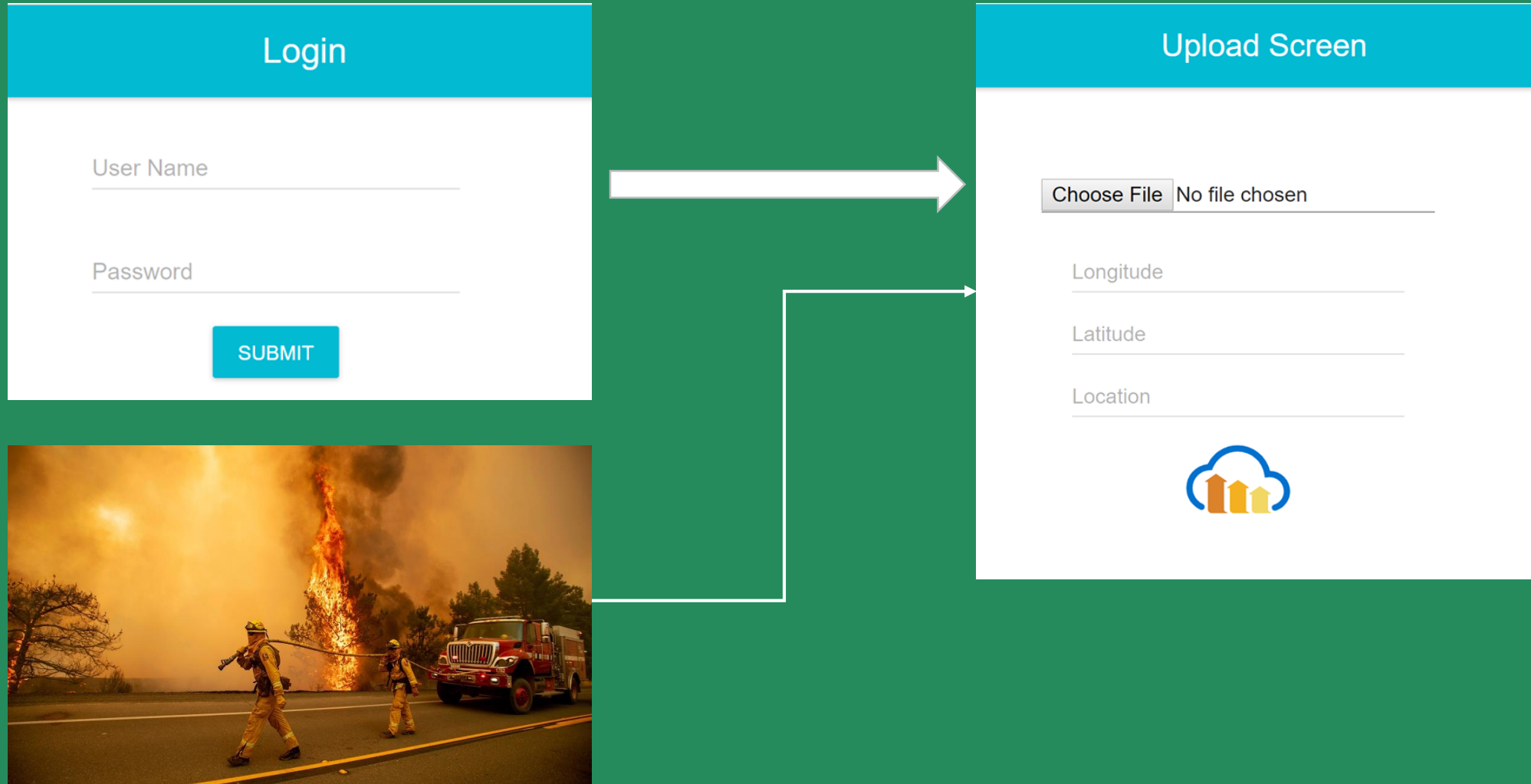
Homogenization

Export

Analysis

Response

# Pictorial analysis to give scene context



# Realtime Tweet analysis for disaster status

The screenshot displays the MongoDB Compass web interface. At the top, there are tabs for 'Documents', 'Aggregations', 'Schema', 'Explain Plan', 'Indexes', and 'Validation'. The 'Documents' tab is active. A search bar at the top contains the filter 'fire'. To the right of the search bar are buttons for 'FILTER', 'OPTIONS', 'FIND', 'RESET', and a menu icon. Below the search bar, there is a green 'INSERT DOCUMENT' button and a 'VIEW' section with 'LIST' and 'TABLE' options. On the right side of the document list, it says 'Displaying documents 121 - 140 of 192' with navigation arrows. The main area shows a single document with the following fields:

```
> {  _id: ObjectId("5c8d8392e956d64c5eb1724b")
    processed: false
    tweet: "#PittMeadows Fire crews on scene of a large brush fire just south of ..."
    metadata: Object
      date: 2019-03-16T23:15:25.000+00:00
      datatype: "tweet"
      __v: 0}
```

On the right side of the document, there are icons for edit, copy, share, and delete.

Input

Homogenization

Export

Analysis

Response

# Homogenization of the data to uniform schema

INSERT DOCUMENT VIEW LIST TABLE					Displaying documents 21 - 40
badreports					
	_id ObjectId	processed Boolean	tweet String	datatype String	__v Int32
21	5c8d644f702dd64782708424	false	"RT @LATAMforTRUMP: If tomor	"tweet"	0
22	5c8d644f702dd64782708425	false	"RT @999Malaysia: Newtown fir	"tweet"	0
23	5c8d644f702dd64782708426	false	"RT @liamyoung: Today I marcl	"tweet"	0
24	5c8d644f702dd64782708427	false	"RT @AuroraIntel: #Hamas secu	"tweet"	0
25	5c8d644f702dd64782708428	false	"RT @koreandaughter: My bf in	"tweet"	0
26	5c8d644f702dd64782708429	false	"RT @ReaganWorld: MS-13 membe	"tweet"	0
27	5c8d7729e956d64c5eb171df	false	"RT @felipeneto: Essa galera	"tweet"	0
28	5c8d7729e956d64c5eb171e0	false	"@stevematic @PeteButtigieg "	"tweet"	0
29	5c8d7729e956d64c5eb171e1	false	"RT @JK_followers: Correction	"tweet"	0
30	5c8d772ae956d64c5eb171e2	false	"And thank you to @GovMurphy	"tweet"	0
31	5c8d772ae956d64c5eb171e3	false	"RT @WYP_ESykes: Flood siren:	"tweet"	0
32	5c8d772ae956d64c5eb171e4	false	"@artusmall_ É horrível que	"tweet"	0
33	5c8d772be956d64c5eb171e5	false	"RT @RyanAFournier: This is (	"tweet"	0
34	5c8d772be956d64c5eb171e6	false	"RT @AshBettaKetchum: Fire h	"tweet"	0
35	5c8d772be956d64c5eb171e7	false	"omygod i just noticed. mich	"tweet"	0
36	5c8d772ce956d64c5eb171e8	false	"one day one of my future emp	"tweet"	0
37	5c8d772ce956d64c5eb171e9	false	"RT @charliekirk11: The Democ	"tweet"	0

Input

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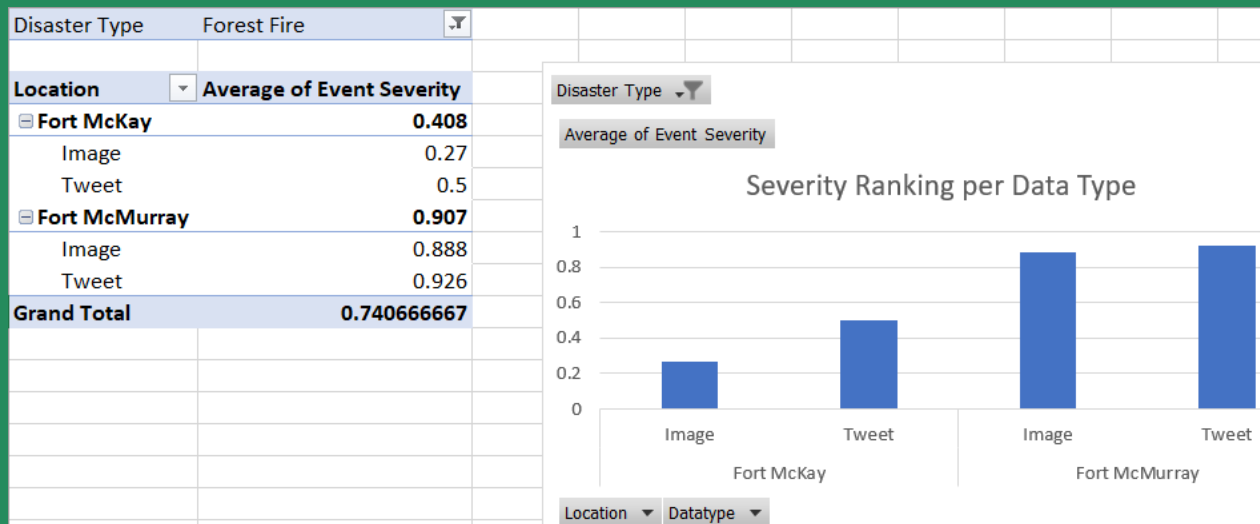
# Simple exportation of data for frequent analysis

Data Point	id	Datatype	Tweet	Image ID	Location	Event Severity	Disaster Type
1	f09cw84nuerp	Tweet	fortmcmurray fire is scaring me #savemenow	null	Fort McMurray	0.99	Forest Fire
2	owcn48wu48rp3	Tweet	traffic is sloooooow	null	Fort McMurray	0.99	Forest Fire
3	w48ncw84puw8	Tweet	evacuated the bottom part of the city	null	Fort McKay	0.24	Forest Fire
4	0wn84cy87wy4c	Tweet	long cold winter won't effect fire season	null	Fort McMurray	0.82	Forest Fire
5	w9nw9nnwc984y	Tweet	indigenous communities neglected	null	Fort McMurray	0.92	Forest Fire
6	fnc7rwy7462548	Tweet	driving through hell right now	null	Fort McKay	0.83	Forest Fire
7	38nc4ytw8ycerw	Tweet	@ethan lue has helped cover the #wildfires	null	Fort McKay	0.43	Forest Fire
8	w9n4c9w89w8n	Tweet	be firesmart and #safe #fortmcmurray fire	null	Fort McMurray	0.91	Forest Fire
9	w9c3n48c57w84	Image	null	forest_fire_00.jpg	Fort McMurray	0.99	Forest Fire
10	ww09wwergw98	Image	null	forest_fire_01.jpg	Fort McMurray	0.93	Forest Fire
11	w9wcr9wnyer9pt	Image	null	forest_fire_02.jpg	Fort McKay	0.34	Forest Fire
12	cw9e4nwp48ny5	Image	null	forest_fire_03.jpg	Fort McMurray	0.92	Forest Fire
13	ad9e8tncpe98otr	Image	null	forest_fire_04.jpg	Fort McKay	0.2	Forest Fire
14	ww9e84nyptw8u	Image	null	forest_fire_05.jpg	Fort McMurray	0.79	Forest Fire
15	9w8n4vw93vyn4	Image	null	forest_fire_06.jpg	Fort McMurray	0.81	Forest Fire

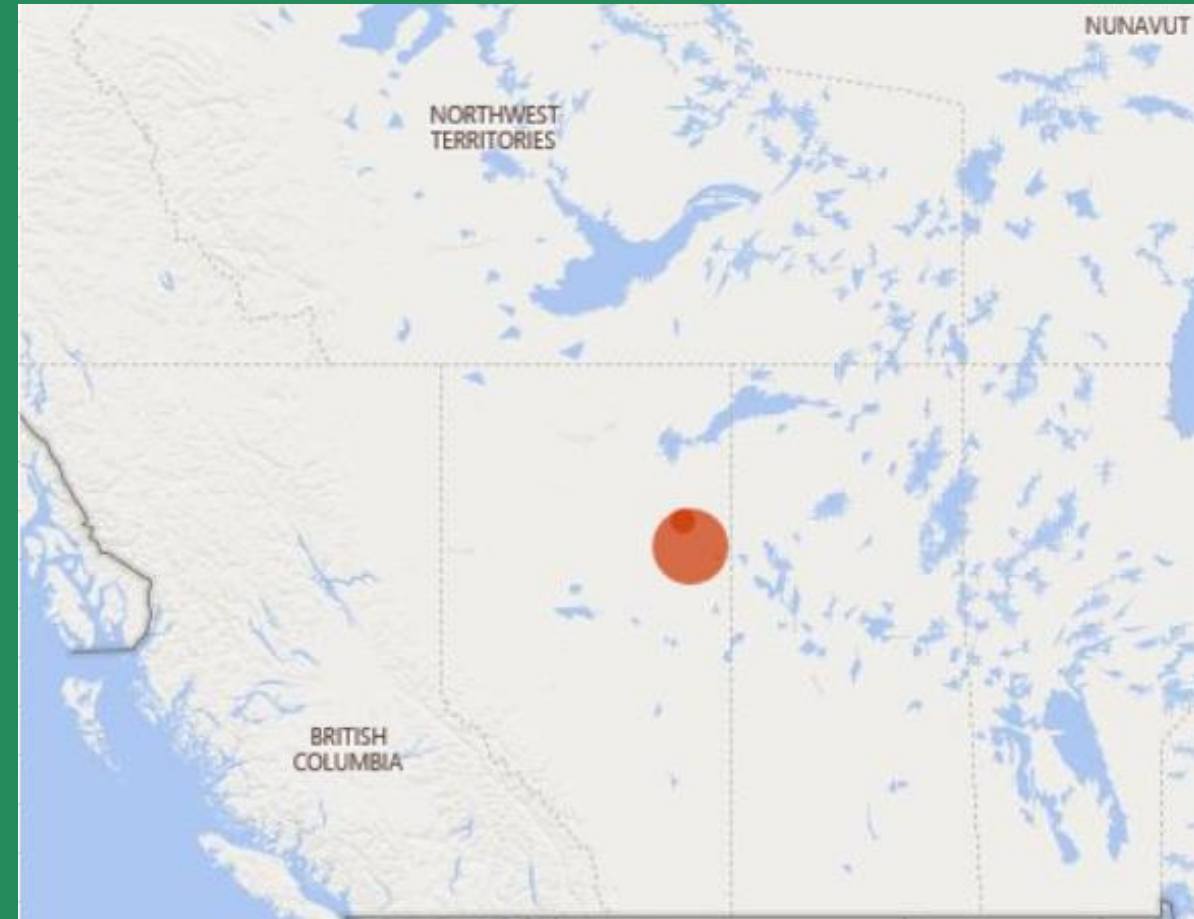
*Export MongoDB to a .csv file, to be analyzed in tool of choice*



# Fast analysis of current disaster state



*Generate whatever needed insights in a matter of minutes*



Input

Homogenization

Export

Analysis

Response



# Fast response and quick action



*Forest fire day 0  
(severity = 0.79)*



*Forest fire day 1  
(severity = 0.02)*



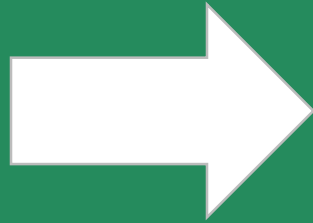
***More proactive communication, can allow less sporadic evacuation time, and could've potentially saved ~\$80M***



Response improvement potential of  is huge!



Global disasters increasing by 150%+ over the next 10 years



Communication time loss is significant is a big bottleneck



↓ Response time → ↑ Recovery

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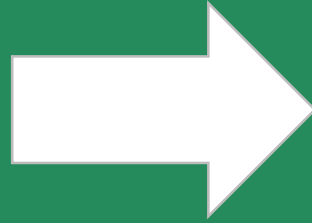
**Lives positively impacted on a global scale**



# Challenges going forward, should be surmountable

Validation of data reliability and establishing data governance practices

Economies of scale for social media data



Statistical/flagging processes in output formation to eliminate outliers

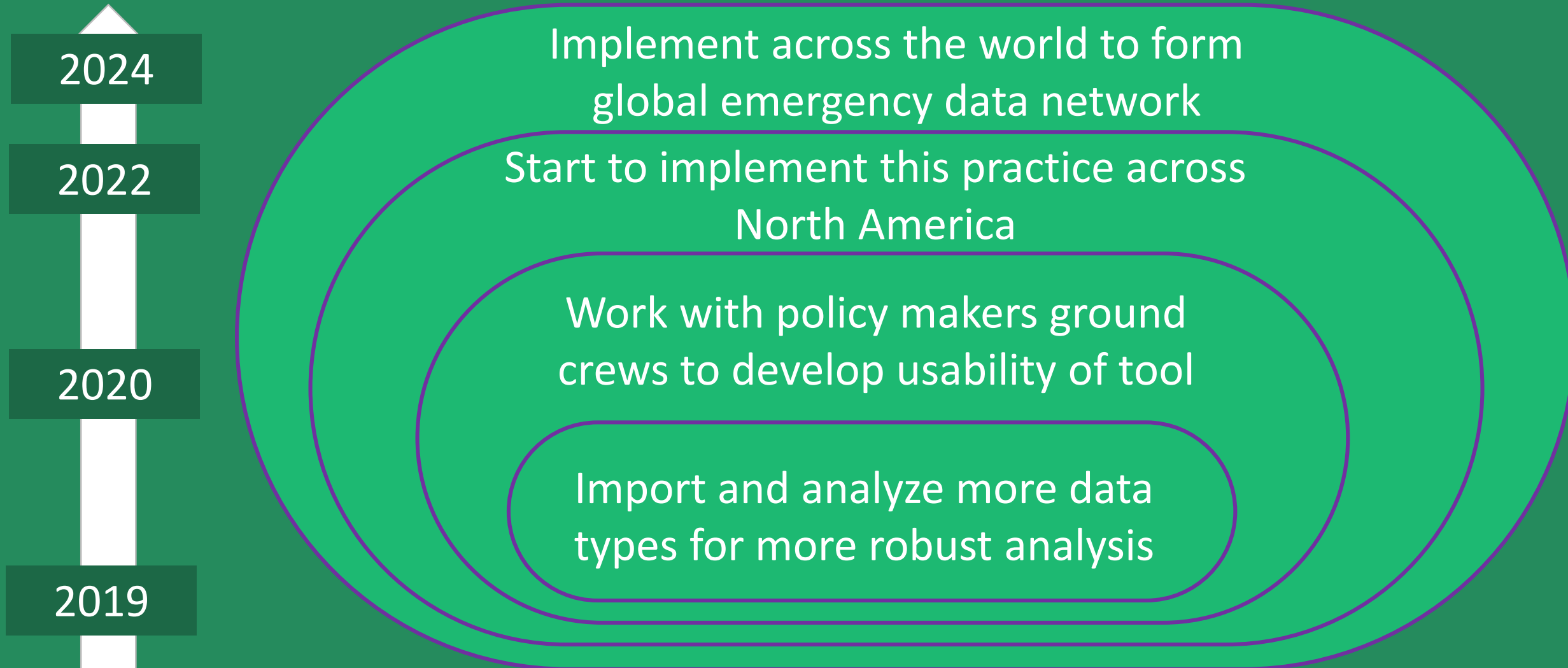
Buy-in to using this tool on the ground

Seamlessly integrating the tool into current on-the-ground practice

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**As more data is analyzed for responses, the more coordination can be developed between analysts and response crew**

# Next Steps and Implementation Strategy

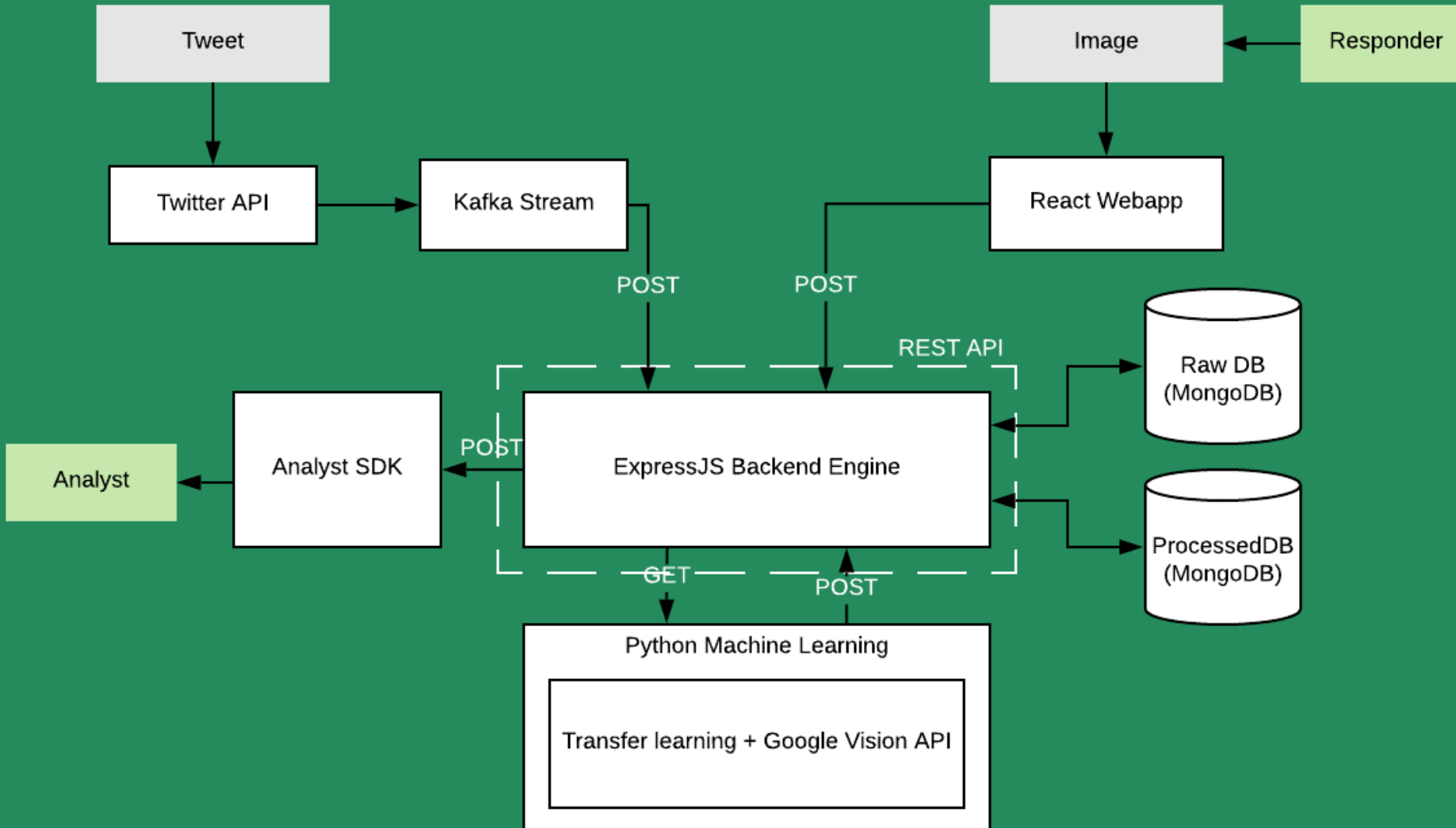




Thanks for your time!

# Appendix

## Exhibit A – System diagram



## Exhibit B – Impact Driver Calculations

	Annual Spend	4% Cost savings *[1]
Canada's Disaster Relief Spend 2018 [2]	\$900,000,000	\$36,000,0010
US Disaster Relief Spend 2019 [3]	\$19,500,000,000	\$780,000,000
<b>US/Canada cost savings per annum</b>		<b>\$816,000,000</b>

\* Stats from [1] suggest an 8% average cost saving on projects using data infrastructures in retail businesses. Assume that data infrastructures are on average 50% less effective in disaster management due to the complexity and variation of disaster situations.

[1] <https://www.mckinsey.com/~media/McKinsey/Business%20Functions/Marketing%20and%20Sales/Our%20Insights/EBook%20Big%20data%20analytics%20and%20the%20future%20of%20marketing%20sales/Big-Data-eBook.ashx>

[2] <https://www.cbc.ca/news/canada/ottawa/canada-extreme-weather-costs-pbo-report-1.3465264>

[3] <https://www.americanactionforum.org/insight/federal-disaster-relief-and-the-federal-budget/>

[4] <https://interactive.unocha.org/publication/globalhumanitarianoverview/>

## Exhibit C – Fort McMurray Calculations

### Mental Health Savings Calculations

	Actual	Improved
Time given to evacuate	$\geq 30$ min [1]	$>1$ h*
Driving speed while evacuating	7.2 min /km [2]	5.4 min/ km **
Mental health cost	2.27B [3]	2.19B***

\* Assume with better data governance and communication, communities could have been given twice as long an evacuation notice

\*\* With longer evacuation notices, Highway 63 would not have been as congested. Assume that on average travel time was improved by 25%

\*\*\* Assume the harrowing evacuation contributed to 15% of the mental health bill. By reducing the time by 25% on average, we'll reduce expenditure on mental health by 3.75%.

[1] <https://edmontonjournal.com/news/insight/timeline-of-evacuation-and-return-to-fort-mcmurray>

[2] <https://edmontonjournal.com/news/local-news/when-evacuation-was-ordered-mcmurray-principal-fled-with-busload-of-students>

[3] <https://www.moneysense.ca/news/the-costs-of-the-fort-mcmurray-fire-one-year-later/>

## Exhibit D – Fort McMurray Stats

What	Amount	Source
Damage	>= \$ 3.6 B CAD	[1]
Cost (damage + lost revenue + infrastructure damage + mental health + more )	\$8.9B	[5]
Evacuees	>=88 000	[1]
Fort McMurray Municipality cost of fighting	\$141.6 M CAD	[2]
Canadian Red Cross donations	\$325 M	[3]
Structures destroyed	>2400	[4]

[1]<https://business.financialpost.com/feature/in-the-shadow-of-the-beast-two-years-after-the-monster-fire-fort-mcmurray-struggles-for-a-different-future>

[2]<https://www.cbc.ca/news/canada/edmonton/141m-fort-mcmurray-wildfire-disaster-recovery-program-1.4076986>

[3]<https://www.cbc.ca/news/canada/edmonton/red-cross-still-helping-people-in-need-2-years-after-fort-mcmurray-wildfire-1.4643954>

[4] <https://www.cbc.ca/news/canada/edmonton/fort-mcmurray-wildfire-municipal-review-mixed-messages-1.4224287>

[5] <https://www.alberta.ca/assets/documents/Wildfire-KPMG-Report.pdf>



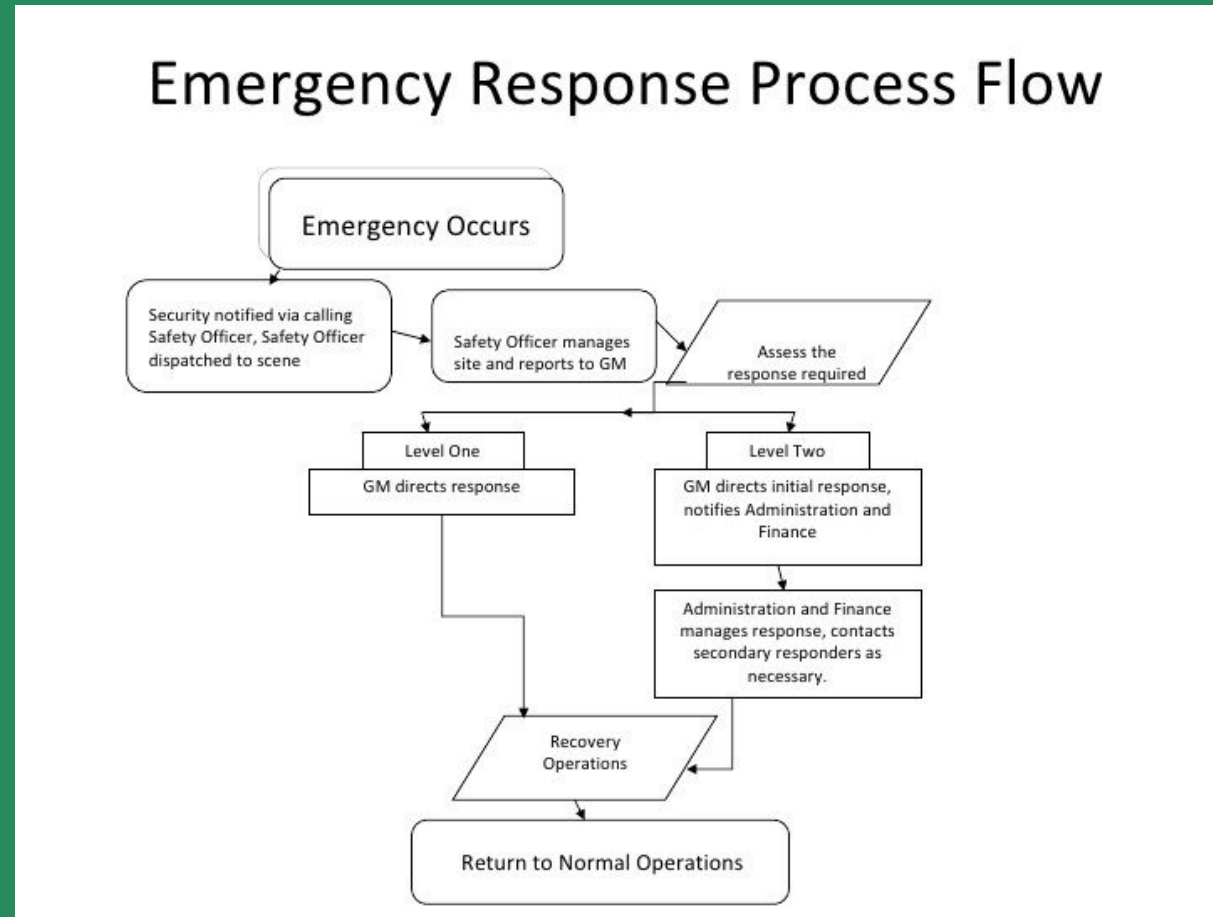
## Exhibit E – General State of Disaster Stats

What	Amount	Source
Number of lives lost in disaster in 2018	10809 lives	[1]
Number of natural disaster	282	[1]
Cost	\$188B USD	[2]

[1] <https://ourworldindata.org/natural-disasters#deaths-from-disasters>

[2] [https://www.washingtonpost.com/weather/2018/12/26/cost-natural-disasters-this-year-billion/?noredirect=on&utm\\_term=.f9ff748ba8c3](https://www.washingtonpost.com/weather/2018/12/26/cost-natural-disasters-this-year-billion/?noredirect=on&utm_term=.f9ff748ba8c3)

# Exhibit F – On the Ground Response Procedure



- [1] [https://www.ihsa.ca/rtf/health\\_safety\\_manual/pdfs/legal\\_responsibilities\\_emergencies/Emergency\\_Procedures.pdf](https://www.ihsa.ca/rtf/health_safety_manual/pdfs/legal_responsibilities_emergencies/Emergency_Procedures.pdf)
- [2] <https://www.northbrucepeninsula.ca/en/live/resources/Documents/Guidelines-for-a-Municipal-Forest-Fire-EP-2017.pdf>

## Exhibit G – Other References

1. [https://www.itu.int/en/ITU-D/Emergency-Telecommunications/Documents/Zimbabwe\\_2011/Communication%20challenges%20during%20past%20disasters.pdf](https://www.itu.int/en/ITU-D/Emergency-Telecommunications/Documents/Zimbabwe_2011/Communication%20challenges%20during%20past%20disasters.pdf)
2. [https://link.springer.com/chapter/10.1007%2F978-3-319-40902-3\\_24](https://link.springer.com/chapter/10.1007%2F978-3-319-40902-3_24)
3. [\*\*https://www.tandfonline.com/doi/abs/10.1080/01431161.2015.1117684\*\*](https://www.tandfonline.com/doi/abs/10.1080/01431161.2015.1117684)
4. [Emergency management](#)
5. <https://www.forbes.com/sites/trevornace/2017/12/15/how-technology-is-advancing-emergency-response-and-survival-during-natural-disasters/#3d442ee9cc84>
6. <https://www.ifrc.org/en/news-and-media/opinions-and-positions/speeches/2005/disaster-response---challenges-to-recovery/>
7. <https://phys.org/news/2017-03-disaster-relief-efforts-game-theory.html>
8. <https://link.springer.com/article/10.1007/s10796-009-9174-z>