



SIRP: Flood Mitigation Impacts

Market Research Report | DRAFT



PROVIDING MORE

Prepared for: EPCOR, Stormwater Integrated Resource Planning (SIRP)
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Purpose: Phase 3 - Public opinion survey

EPCOR's Stormwater Integrated Resource Planning group (SIRP) is conducting a variety of public engagement activities to build recommendations for flood mitigation

This study in particular was designed to supplement existing activities to better understand:

- Most important issues (top-of-mind) among Edmontonians and how climate issues rank
- Understand citizen preferences for infrastructure protection relative to flood impacts using moderate, major and extreme impacts
- Examine findings in context of demographics and past flood experience

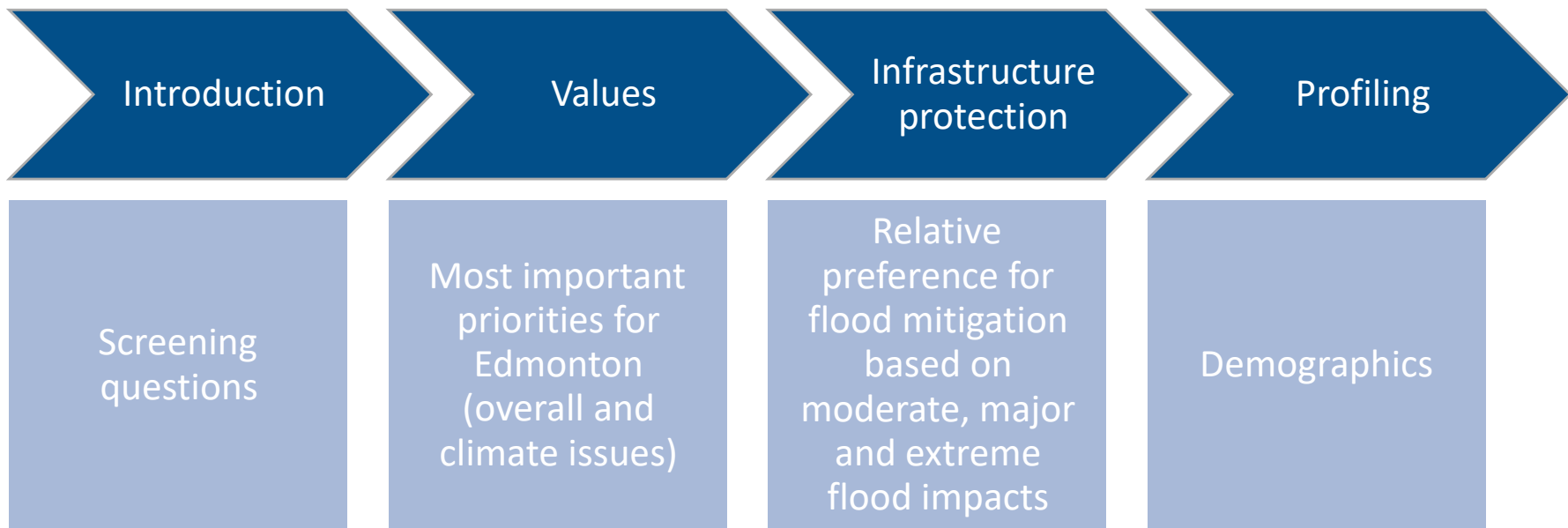
Findings will be integrated with other technical studies and public engagement efforts. SIRP will present their recommendations to the Utility Committee October 2018.

Approach: Phase - Public opinion survey

- **Approach:** Online survey, general population
- **Region:** Edmonton proper
- **Branding:** The study was branded; respondents were aware that EPCOR is the sponsor
- **Methodology:** Choice-exercises to identify citizen preferences for what to protect during a flood
- **Median completion time:** 25-minutes
- **Field dates:** Aug 9-19, 2018
- **Sample size:** n=1,500 Edmonton Proper
 - **Accuracy:** This online survey utilizes a representative but non-random sample; therefore, margin of error is not applicable. However, a probability sample of this size would yield a margin of error of +/- 2.5 percentage points at a 95% confidence interval
 - **Weighting:** Data was weighted to reflect gender and age of the Edmonton population according to Statistics Canada
- **Sample source:** Third-party sample (MARU Voice Canada)

Survey measures: Phase 3 - Public opinion survey

The following illustrates the key measures used in the study and the overall flow of the questionnaire for respondents:



Choice modeling was used for the major and extreme impacts. Moderate impacts were measured by asking top 5.

Approach: Choice modeling (MaxDiff)

- A choice-based approach (MaxDiff) was used to identify the relative preferences among Edmonton residents for infrastructure protection
- Major and extreme impacts were tested using the MaxDiff approach
- Moderate flood impacts were also explored using a more simplistic question, to keep the questionnaire length under 30-minutes
 - Respondents reviewed the list of impacts, selecting the top 5 they felt should be prioritized when it comes to protection
- A highly experienced statistician conducted the design of the model and analyzed the raw data, identifying the relative preferences among citizens

Why did we use choice-based questions?

- If a survey asks, “*How important is it to protect the following?*” everything tends to be rated as important
- Choice-based survey questions employ a more realistic framework where respondents evaluate potential options (or impacts, in this case)
- By simulating the act of making a choice, trading-off various “impacts”, the respondent is more likely to respond as they would in real life. This improves the reliability of the findings
- Outputs illustrate the relative importance of each impact tested; their preference for what should be protected based on flood impacts/conditions

MaxDiff questions: Storm impacts



Looking at the five (5) "major" impacts from a flood below, please indicate which you feel is most important priority to you personally when it comes to flood prevention and building protection.

Please also select the "major" impact which you personally feel is the lowest priority when it comes to flood prevention and building protection.

NOTE: You will see these statements several times. Note that for each question, you will see a different set of statements and we would like you to select the top priority to mitigate and the lower priority to mitigate.

If you would like to see the description of a flood again, please click [here](#).

As a result of flooding ...

Please select one response for each ranking.

Top priority Select one (1)		Lower priority Select one (1)
<input type="radio"/>	The impacts of flooding cause extensive personal stress (e.g., depression, anxiety, sleep disorders, etc.) for several months as you worry about home repairs, finances and accommodations	<input type="radio"/>
<input type="radio"/>	For a few months, residents and contractors in your neighbourhood are at risk of illness (e.g., respiratory and digestive issues) through contact with sewage and mold while clean-up and repairs are made	<input type="radio"/>
<input type="radio"/>	The ecosystem (vegetation, insects and wildlife) in a large area (e.g., area the size of a pond or a neighbourhood) is killed as a result of a flood-related accident involving a truck/train derailment spilling the chemicals, oil or gases it is carrying	<input type="radio"/>
<input type="radio"/>	Low income individuals are unable to afford repairs to their homes without assistance, forcing them to live in a damaged home for several months	<input type="radio"/>
<input type="radio"/>	The ecosystem (vegetation, insects and wildlife) in a large natural area is killed due to a large amount of chemical pollutant or sewage spilling into it	<input type="radio"/>

Next

- Respondents were shown five (5) statements at a time, in random order
- Respondents were shown 12-15 sets of statements
- Statements were developed by the SIRP team to reflect the impacts a flood could have on infrastructure in the community

MaxDiff questions: Storm impacts



Looking at the five (5) "major" impacts from a flood below, please indicate which you feel is most important priority to you personally when it comes to flood prevention and building protection.

Please also select the "major" impact which you personally feel is the lowest priority when it comes to flood prevention and building protection.

NOTE: You will see these statements several times. Note that for each question, you will see a different set of statements and we would like you to select the top priority to mitigate and the lower priority to mitigate.

If you would like to see the description of a flood again, please click [here](#).

As a result of flooding ...

Please select one response for each ranking.


Top priority Select one (1)		Lower priority Select one (1)
<input checked="" type="radio"/>	The impacts of flooding cause extensive personal stress (e.g., depression, anxiety, sleep disorders, etc.) for several months as you worry about home repairs, finances and accommodations	<input type="radio"/>
<input type="radio"/>	For a few months, residents and contractors in your neighbourhood are at risk of illness (e.g., respiratory and digestive issues) through contact with sewage and mold while clean-up and repairs are made	<input type="radio"/>
<input type="radio"/>	The ecosystem (vegetation, insects and wildlife) in a large area (e.g., area the size of a pond or a neighbourhood) is killed as a result of a flood-related accident involving a truck/train derailment spilling the chemicals, oil or gases it is carrying	<input type="radio"/>
<input type="radio"/>	Low income individuals are unable to afford repairs to their homes without assistance, forcing them to live in a damaged home for several months	<input type="radio"/>
<input type="radio"/>	The ecosystem (vegetation, insects and wildlife) in a large natural area is killed due to a large amount of chemical pollutant or sewage spilling into it	<input checked="" type="radio"/>

Next

- Respondents selected, from the list of five (5) impacts, which one (1) they felt was the top priority and which one (1) they felt was the lower priority
- After answering the first set of five (5) statements, they answered another set of five (5) statements →

MaxDiff questions: Storm impacts





Looking at the five (5) "major" impacts from a flood below, please indicate which you feel is most important priority to you personally when it comes to flood prevention and building protection.

Please also select the "major" impact which you personally feel is the lowest priority when it comes to flood prevention and building protection.

NOTE: You will see these statements several times. Note that for each question, you will see a different set of statements and we would like you to select the top priority to mitigate and the lower priority to mitigate.

If you would like to see the description of a flood again, please click [here](#).

As a result of flooding ...
Please select one response for each ranking.

Top priority Select one (1)		Lower priority Select one (1)
<input type="radio"/>	The ecosystem (vegetation, insects and wildlife) in a large natural area is killed due to a large amount of chemical pollutant or sewage spilling into it	<input checked="" type="radio"/>
<input type="radio"/>	For a few months, residents and contractors in your neighbourhood are at risk of illness (e.g., respiratory and digestive issues) through contact with sewage and mold while clean-up and repairs are made	<input type="radio"/>
<input type="radio"/>	The ecosystem (vegetation, insects and wildlife) in your yard, neighbourhood parks, playgrounds and greenspaces is destroyed and vegetation needs to be replanted	<input type="radio"/>
<input checked="" type="radio"/>	A high-rise building with offices and residential condos loses power. The building is inaccessible for several months	<input type="radio"/>
<input type="radio"/>	Major roadways, bridges or transit infrastructure are damaged, doubling your commute to and from your home for several months	<input type="radio"/>

- Example of another set of statements

Public survey: In progress

Additionally, an open public engagement survey is being run

- The questionnaire was modified to reduce the length (removing the “extreme impacts” of a flood)
- **Channels:** EPCOR is sharing access to the survey to a variety of audiences (EPCOR employees, EPCOR social media followers, community associations and other organizations involved in development and climate change)
- **Sampling:** Anonymous “convenience” sampling was used (sampling was not balanced by age/gender/region)
- **Total responses to-date:** n=300 (as of September 20, 2018)
 - Survey will remain open until mid-November to allow for ample public input
- **Median completion time:** 20 minutes
- **Accuracy:** This version of the survey was used to provide an additional channel for public engagement. Given the sample source, standard statistical measures of accuracy do not apply



Summary - Infrastructure Protection

SIRP: Flood Mitigation Impacts

SUMMARY: Most important impacts to protect

Results were consistent across all three (3) impact levels – moderate, major and extreme. From the citizen point-of-view, respondents want to see life-sustaining infrastructure/services and their home protected first and foremost. Environmental infrastructure rated lowest.

Top 5: Moderate impacts

Emergency services buildings are damaged – limited access
Essential utility is lost – limited access
Wait times increase at local hospitals/UCC
Risk of illness due to contact with sewage and mold
Support agencies are displaced, unable to get essential services they need

Respondents answered by choosing their top 5

Top 5: Major impacts

Essential utility is lost – limited access
Hospital/UCC is forced to close – turning away all patients
Emergency services buildings are damaged – limited access
Residences experience serious indoor damage – costly repairs
Risk of illness due to contact with sewage and mold

Respondents answered via a choice exercise (MaxDiff)

Top 5: Extreme impacts

Hospital/UCC is forced to close – turning away all patients
Essential utility is lost – limited access
Risk of illness due to contact with sewage and mold, homes condemned
Emergency services buildings are destroyed – limited access
Basement - risk of death/injury

Base: All respondents (n=1,501)

Sentiment



“It's not important that severely damaged infrastructure doubles my commute time. It IS important that severely damaged infrastructure interferes with emergency services, interferes with clean-up and contractors, and burdens a stressed economy. Without adequate infrastructure, rebuilding cannot proceed in a timely manner.”



Respondents

SIRP: Flood Mitigation Impacts

Respondent profile: Demographics

Gender		%
Male		50%
Female		50%
Age		%
18 – 34 years		34%
35 – 54 years		35%
55+ years		31%
HH Income		%
<\$50K		22%
\$50K-\$99K		35%
\$100K+		32%
Refused/unsure		11%

Education		%
High school		13%
College		33%
University		54%
Employment		%
Full/part/self		66%
Job seeker		9%
Student		3%
Not working		22%
Business owner		%
Yes		4%

Born in Canada		%
Yes		82%
No		18%
Moved to Canada		(n=276)
< 5 years ago		17%
5-10 years ago		15%
11-20 years ago		16%
> 20 years ago		51%
Caregivers		%
Children at home		32%
Caregiver		10%
Receive care		1%
None of these		60%

Base: All respondents (n=1,501)

Respondent profile: Demographics...continued

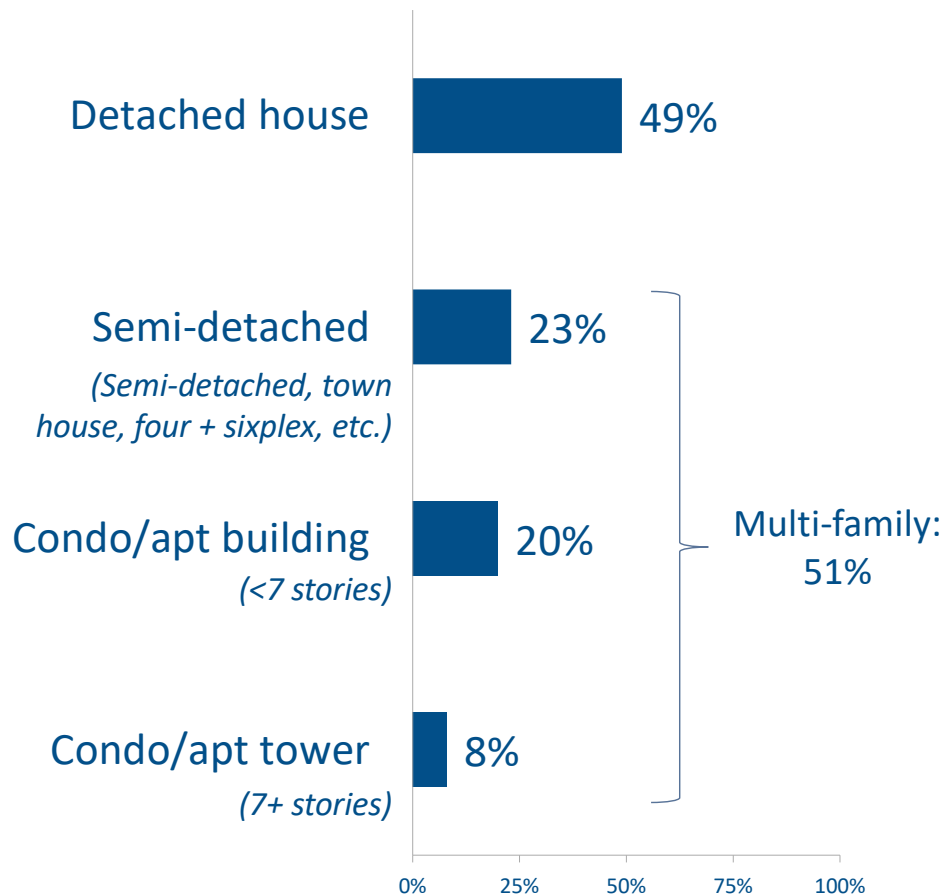
Follow Edm news	%
Closely	82%
<i>Very closely</i>	29%
<i>Somewhat closely</i>	53%
Not Closely	18%
<i>Not very closely</i>	16%
<i>Not at all closely</i>	2%

Lived in Edmonton	%
< 1 year	2%
1-5 years	13%
6-10 years	10%
11-20 years	16%
> 20 years	59%
Community	%
Mature	35%
Established	31%
Developing	26%
Core	8%

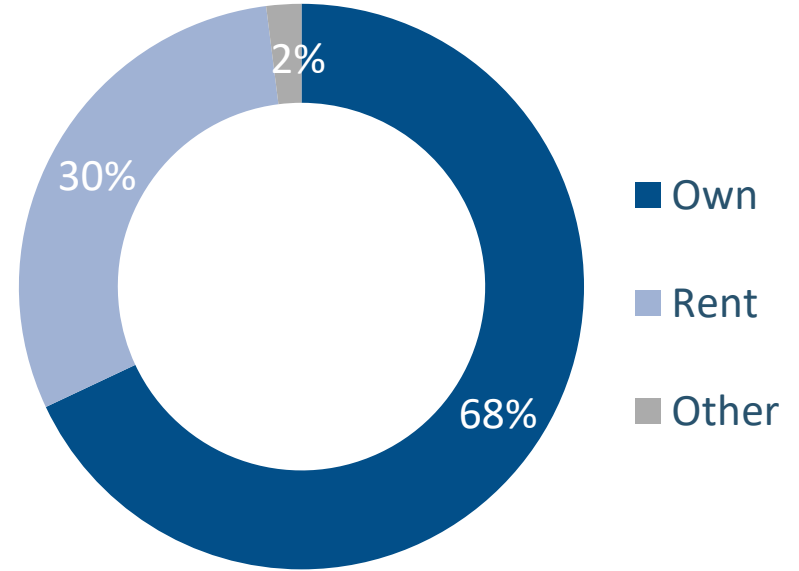
Base: All respondents (n=1,501)

Respondent profile: Residence

"Which of the following best describes your primary Edmonton residence?"



"Do you own or rent your home?"

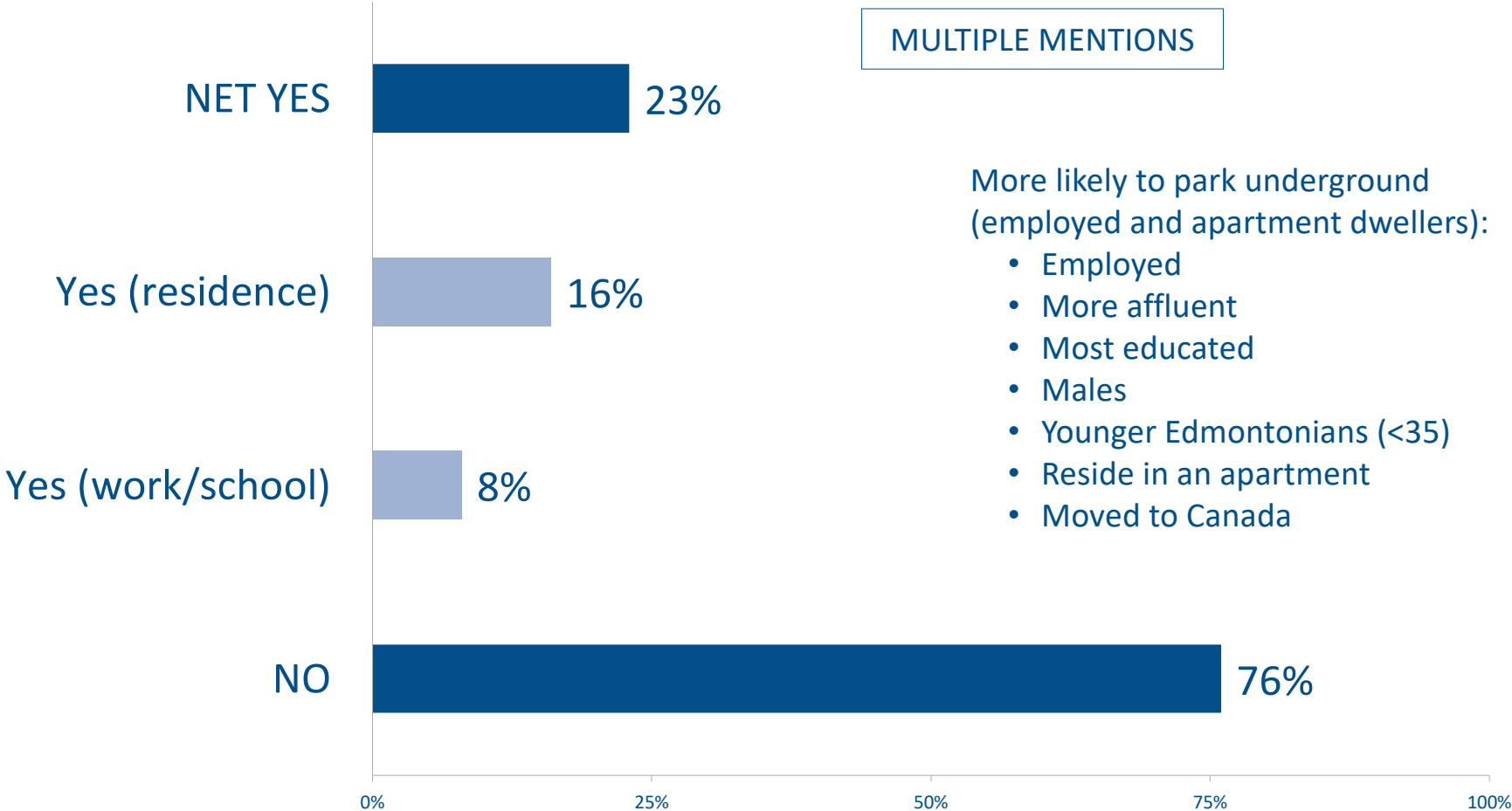


Those who lived in a detached dwelling/own their own home tend to be older, have resided in Edmonton for 20+ years and are more affluent than those who do not own their own home/live in a different type of dwelling.

Base: All respondents (n=1,501)

Respondent profile: Underground parking

"On a typical day living in Edmonton, do you use an underground parking garage?"



Base: All respondents (n=1,501)



Most Important Issues

SIRP: Flood Mitigation Impacts

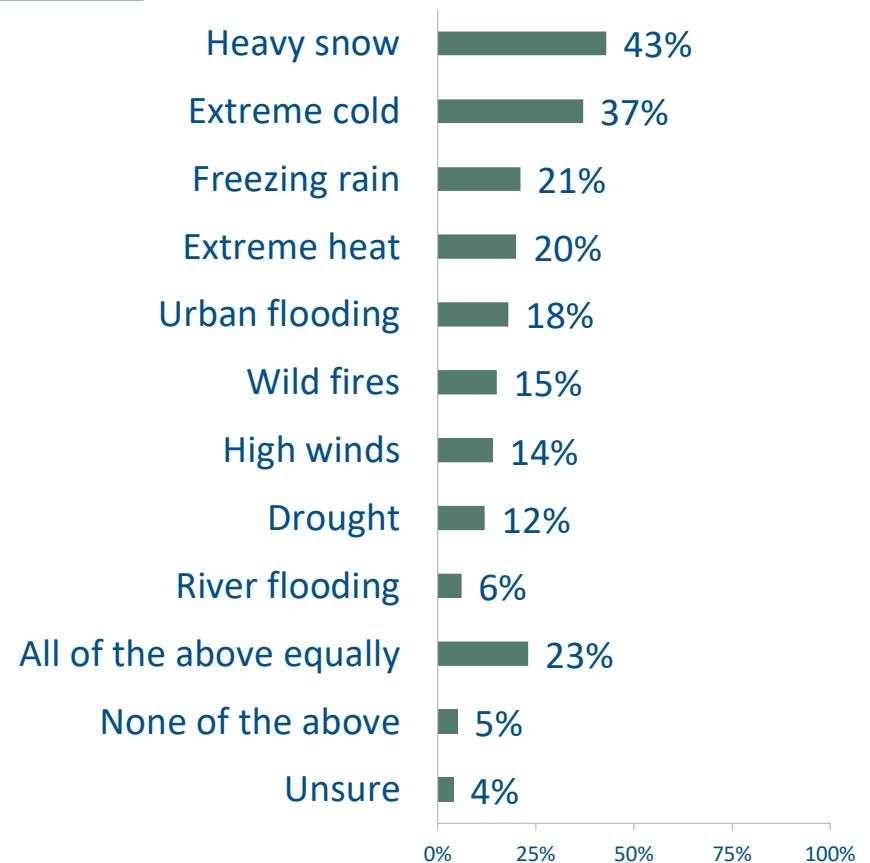
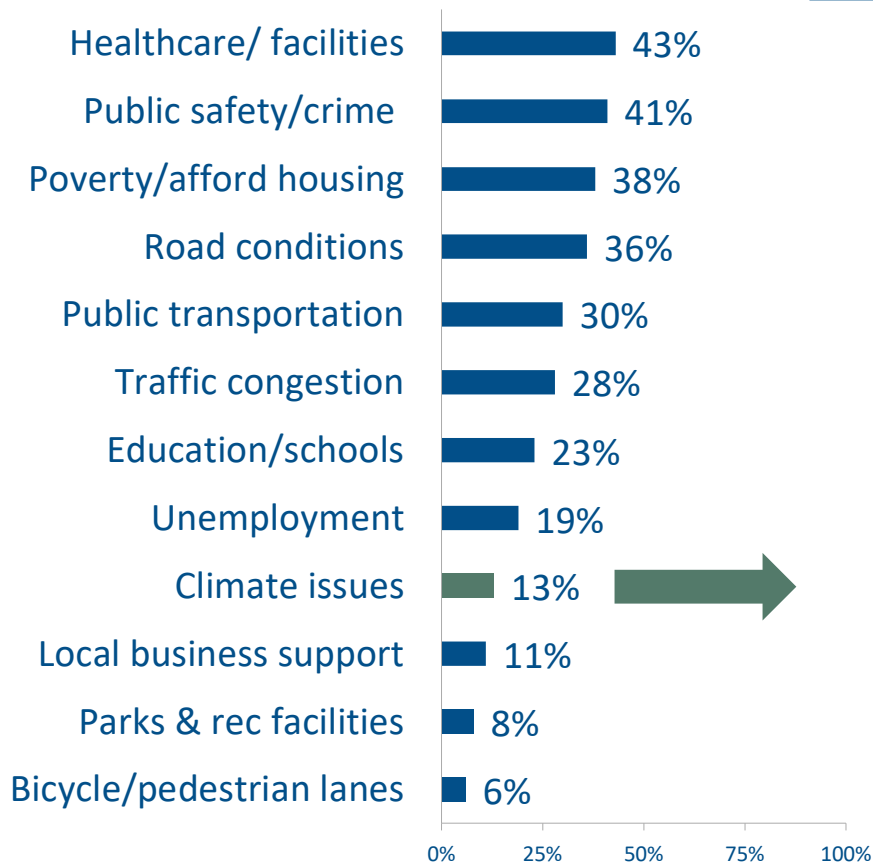
Although ranking lower top-of-mind, the implications of climate change touch on many top municipal priorities



"Please select the issues you personally consider to be extremely important priorities for Edmonton."

"And which climate-related items do you personally consider to be important priorities for life in Edmonton?"

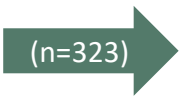
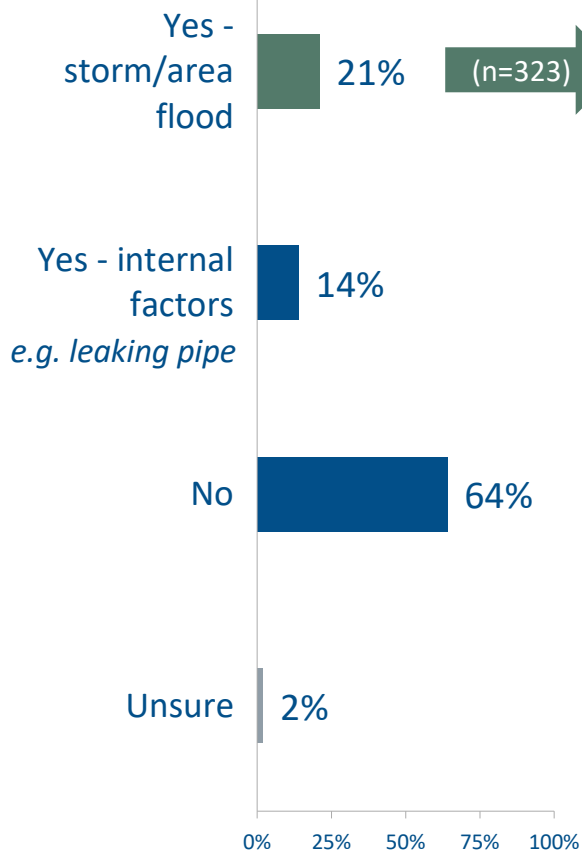
TOP 3 MENTIONS



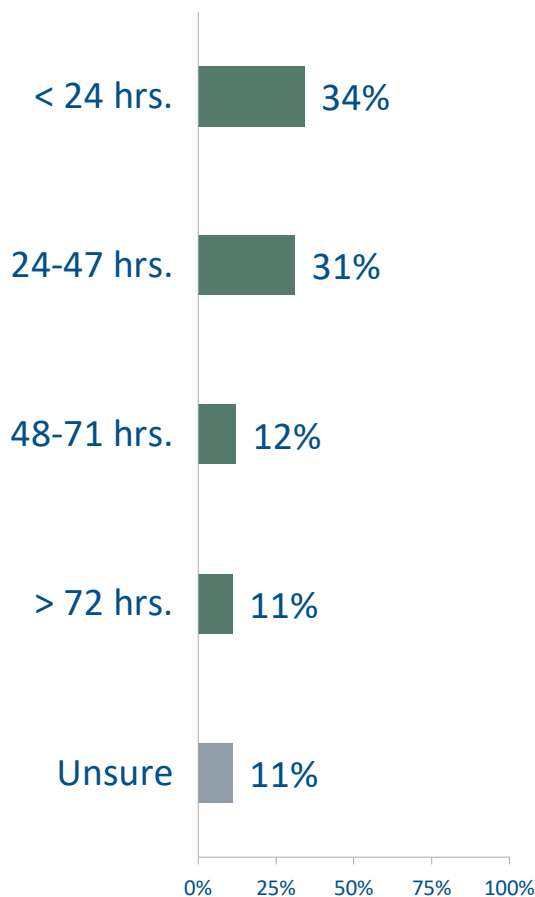
Base: All respondents (n=1,501)

Two-in-ten have experienced storm/area flooding to the home

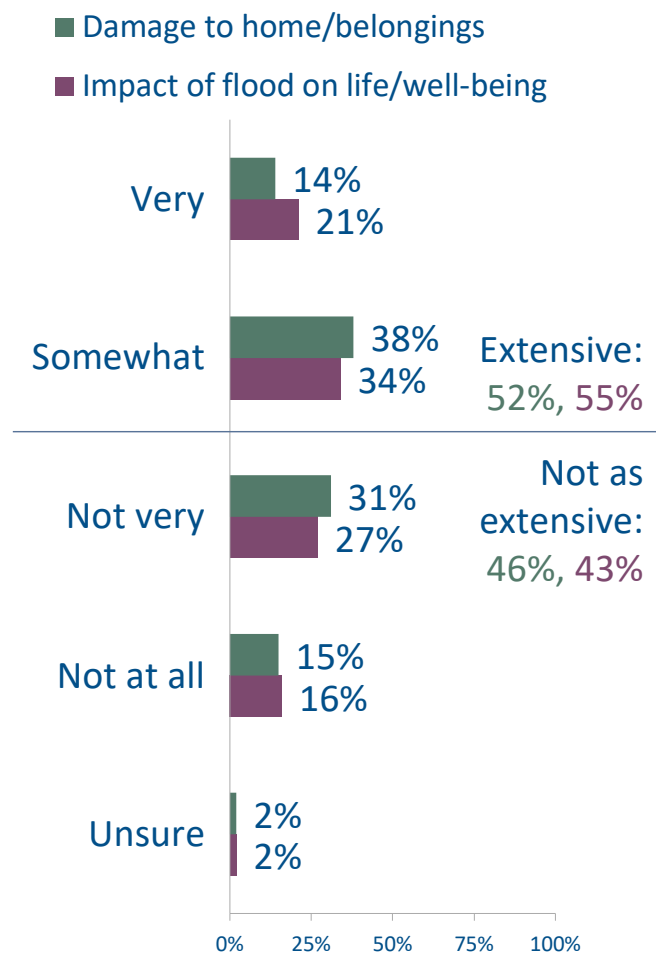
"Have you ever in your adult life experienced a flood in your primary residence?"



*"How long did it take before the water was removed from your home?"**



*"How extensive was the...?"**



Base: All respondents (n=1,501)

*Base: Flooded due to external factors (n=323)



Relative Importance Moderate Flood Impacts

SIRP: Flood Mitigation Impacts

Moderate impacts: Guide to the statements & categories



Full statement shown to respondents	Short-form
Health & safety statements	
Due to flooding impacting the building, wait-times increase at a local hospital or urgent care centre overflowing with patients who become ill or injured during flooding.	Hospital waits increase
For a few weeks, residents and contractors in your neighbourhood are at risk of illness (e.g., respiratory and digestive issues) through contact with sewage and mold while clean-up and repairs are made.	Home - risk of illness
Basement flooding puts residents at risk of injuries (e.g. tripping, pulled muscles, sprains, etc.).	Basement - injury risk
An underpass or parking lot floods at a high rate of speed, causing vehicles to stall and be abandoned by owners, and some minor injuries are incurred.	Underpass floods quickly
Stormwater floods part of the street in front of your home. Flooding is contained to the road between the curbs until it recedes/drains away.	Street flooded at home
Social statements	
Your neighbourhood loses an essential utility (such as power, natural gas or drinking water) for several weeks. Access to your home could be restricted until service is restored.	Essential utilities lost
Emergency services buildings (police, fire, EMS) are damaged, limiting access to services for several weeks for repairs and response times are delayed.	Emerg bldgs damaged
Agencies that support homeless/vulnerable citizens are temporarily displaced for several weeks, unable to get enough essential services they need such as food, shelter or addiction/mental health support.	Support agencies displaced
Family members or close family friends are temporarily displaced from their home, requiring you to care for them or support them for several weeks.	Care for friends/family
Major roadways, bridges or transit infrastructure are damaged, doubling your commute to and from your home for several weeks.	Doubled commute time
The impacts of flooding cause personal stress for several weeks as you worry about home repairs and finances.	Personal stress
A high-rise building with offices and residential condos loses power. The building is accessible but for several weeks, people must take the stairs to their floor.	Highrise no elevator

Moderate impacts: Guide to the statements & categories

Full statement shown to respondents	Short-form
Environmental statements	
Garbage clean-up in your neighbourhood is delayed for several weeks due to large amounts of garbage (e.g., discarded furniture, household items and damaged drywall) piling up in yards, sidewalks and roadways.	Garbage clean-up delayed
Some vegetation, insects and wildlife are all killed in the immediate vicinity of a flood-related accident involving a truck/train derailment spilling the chemicals, oil or gases it is carrying.	Nature killed - chem spill
Some vegetation, insects and wildlife are all killed in a localized area due to a small amount of chemical pollutant or sewage spilling.	Nature killed - pollutants
Neighbourhood parks, trails, creeks and sidewalks are damaged due to soil erosion, making them inaccessible for several weeks while being repaired.	Sidewalks damaged
Vegetation in neighbourhood yards, parks, playgrounds and greenspaces is seriously damaged by flooding and requires some restoration.	Veg requires restoration
Financial statements	
Residential properties in your neighbourhood are damaged and require repairs. Single family homes have up to 6-inches of water in the basement and condos/apartment buildings have up to 6-inches of water in the basement or lower-level suites.	Res - indoor damage
Low income individuals are unable to afford repairs to their homes without assistance, forcing them to live in a damaged home for several weeks.	Some can't afford repairs
Your employer's building (or a family member's employer) is temporarily inaccessible until repairs are completed, causing lost wages for a few weeks.	Work building inaccessible
Homes & properties in your neighbourhood experience serious outdoor damage (e.g. damage to fencing, vehicles, gardens, etc. outside the home). Home-owners are out of pocket thousands of dollars to replace or fix.	Res - outdoor damage
Local businesses and services (e.g. local mall, recreation centre, businesses you frequent, etc.) are forced to close for several weeks.	Businesses closed
Vehicles in parkades, garages and parking lots in your neighbourhood are damaged due to stormwater around the wheels/floorboards/brakes. Vehicles require repairs taking several weeks.	Vehicles damaged

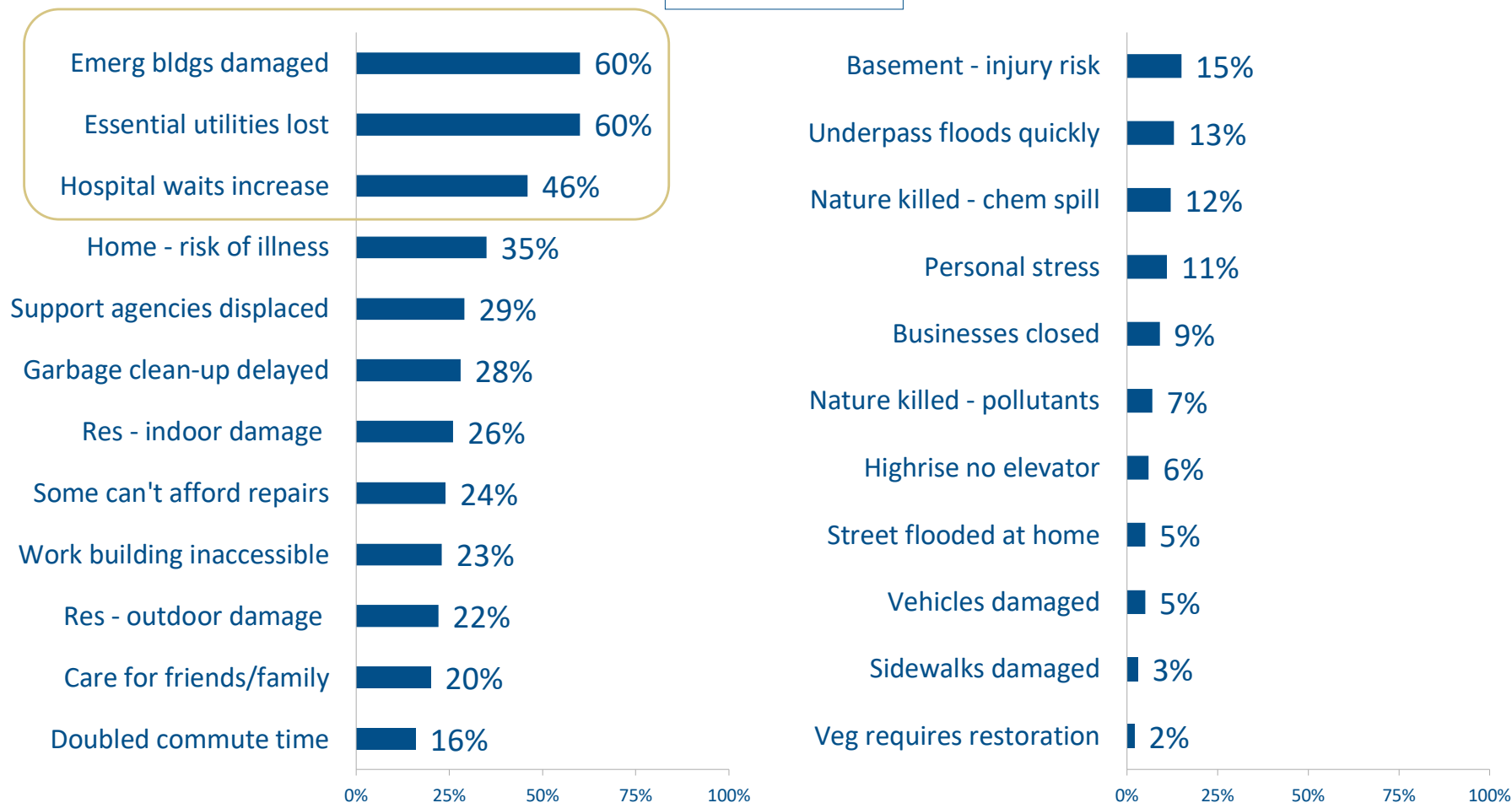
Preference is to protect essential services (healthcare & utilities)

Moderate impacts



“Which of the following ‘moderate impacts’ do you consider to be priorities to protect in the event of a flood?”

TOP 5 MENTIONS



Base: All respondents (n=1,501)

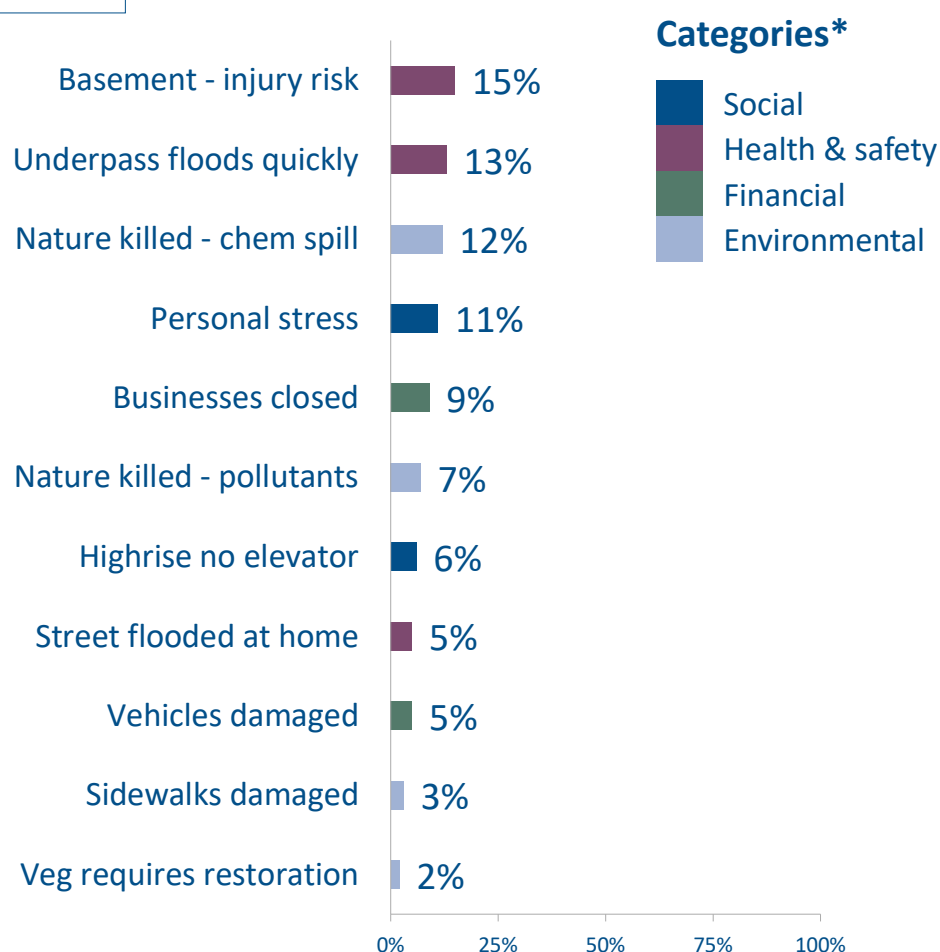
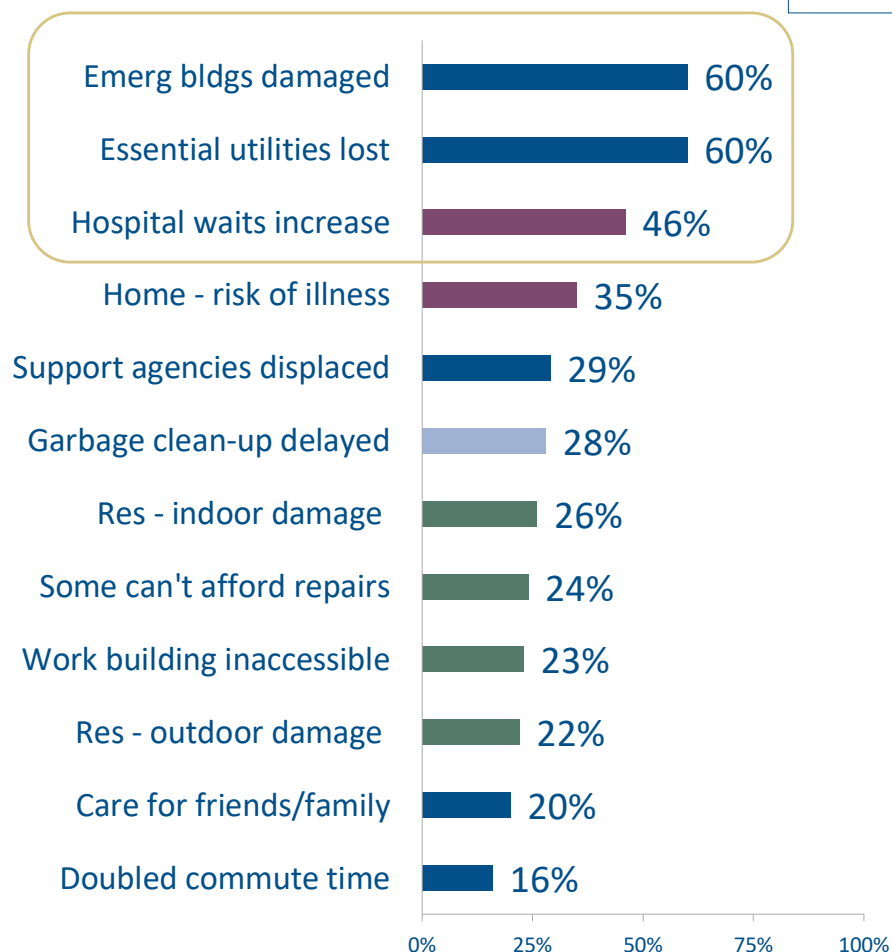
Preference is to protect essential services (healthcare & utilities)

Moderate impacts



“Which of the following ‘moderate impacts’ do you consider to be priorities to protect in the event of a flood?”

TOP 5 MENTIONS



Categories*



Base: All respondents (n=1,501) | *NOTE: Categories, as defined by SIRP

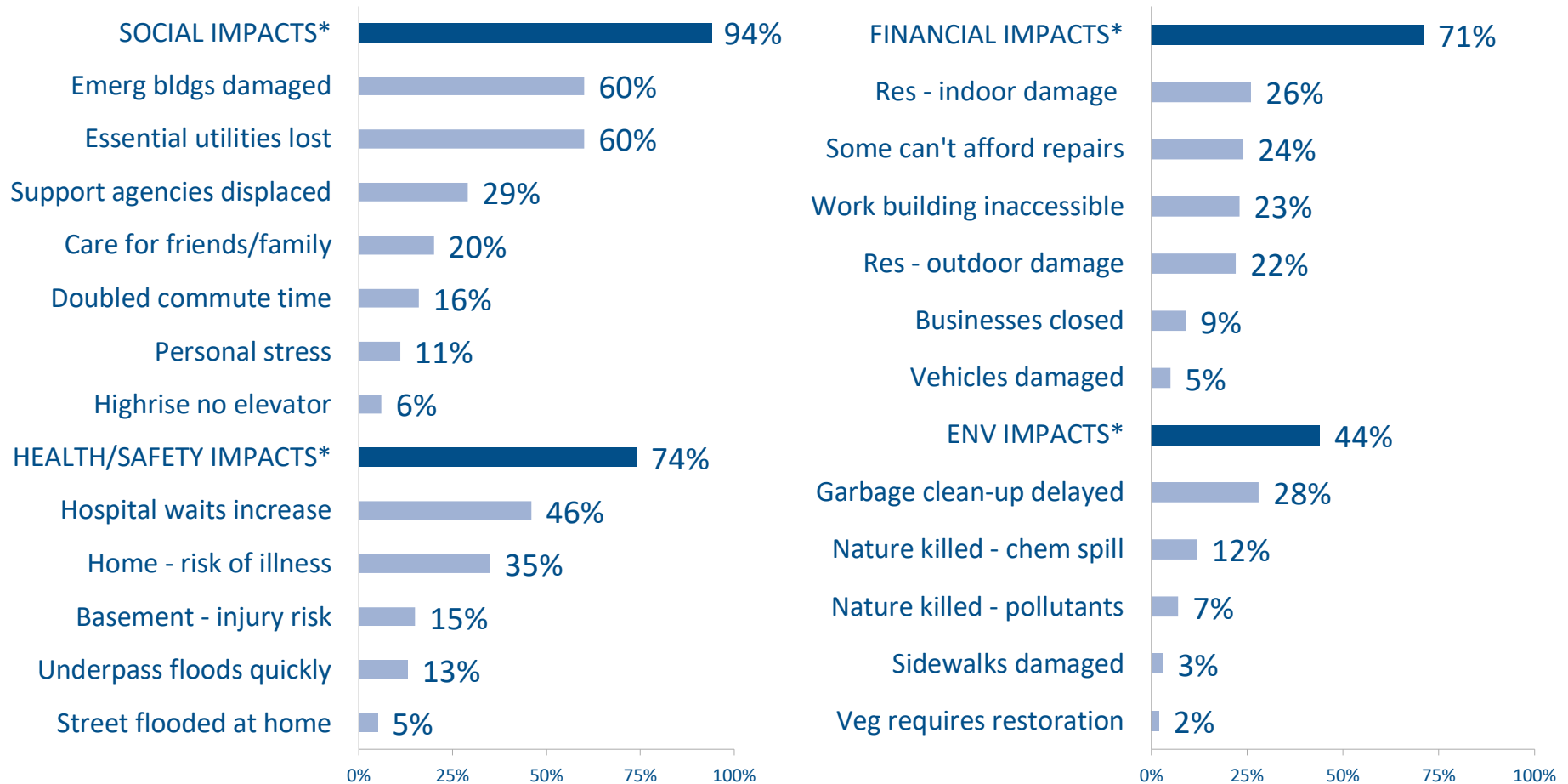
Environmental impacts rank lowest, social highest

Moderate impacts



“Which of the following ‘moderate impacts’ do you consider to be priorities to protect in the event of a flood?”

TOP 5 MENTIONS



Base: All respondents (n=1,501) | *NOTE: NET scores (# of people who picked 1 item in that category)



Relative Importance Major Flood Impacts

SIRP: Flood Mitigation Impacts

Major impacts: Guide to the statements & categories



Full statement shown to respondents	Short-form
Health & safety statements	
Due to flooding impacting the building, a local hospital or urgent care centre is forced to close, turning away all patients.	Hospitals forced to close
For a few months, residents and contractors in your neighbourhood are at risk of illness (e.g., respiratory and digestive issues) through contact with sewage and mold while clean-up and repairs are made.	Home - risk of illness
Basement flooding puts residents at risk of injuries requiring medical attention (e.g. falls, back injuries, electric shock, etc.).	Basement - injury risk
An underpass or parking lot floods at a high rate of speed, causing vehicles to stall or collide, and people need to be rescued from their vehicles and taken to the hospital.	Underpass floods quickly
Stormwater floods streets in your neighbourhood and extends onto your property or lawn. Access to your location is restricted until the area can be cleaned and sanitized.	Street flooded at home
Social statements	
Your neighbourhood loses an essential utility (such as power, natural gas or drinking water) for several months. Access to your home could be restricted until service is restored.	Essential utilities lost
Emergency services buildings (police, fire, EMS) are damaged limiting access to services for several months for repairs. Services are limited during repairs.	Emerg bldgs damaged
Agencies that support homeless or vulnerable citizens are temporarily displaced for several months and unable to get enough essential services they need such as food, shelter or addiction/mental health support.	Support agencies displaced
Family members or close family friends are temporarily displaced from their home, requiring you to care for them or support them for several months.	Care for friends/family
Major roadways, bridges or transit infrastructure are damaged, doubling your commute to and from your home for several months.	Doubled commute time
The impacts of flooding cause extensive personal stress (depression, anxiety, sleep disorders, etc.) for several months as you worry about home repairs, finances and accommodations.	Personal stress
A high-rise building with offices and residential condos loses power. The building is inaccessible for several months.	Highrise inaccessible

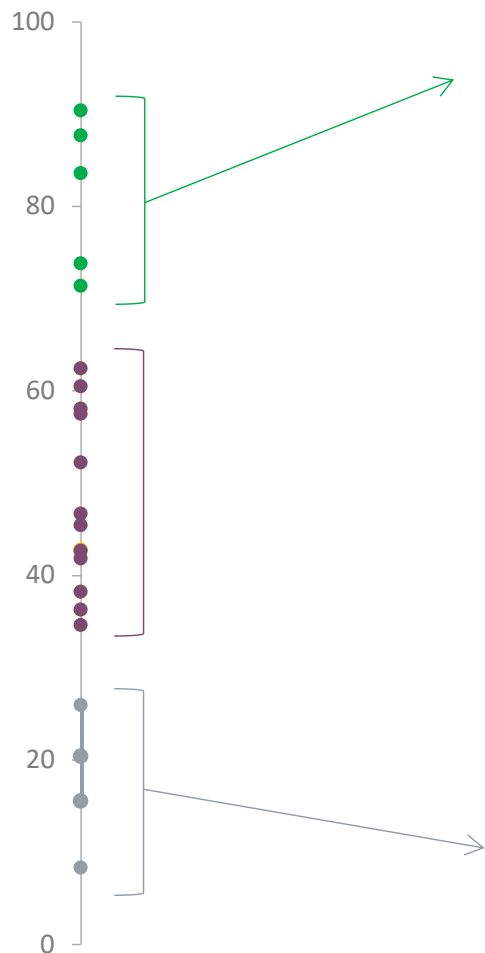
Major impacts: Guide to the statements & categories



Full statement shown to respondents	Short-form
Environmental statements	
Garbage clean-up in your neighbourhood is delayed for several months due to large amounts of garbage (discarded furniture, household items and damaged drywall – all of which are piling up in yards, sidewalks and roadways).	Garbage clean-up delayed
The ecosystem (vegetation, insects and wildlife) in a large area (e.g., area size of a pond or neighbourhood) is killed as result of a flood-related accident involving a truck/train derailment spilling chemicals, oil or gases it is carrying.	Nature killed - chem spill
The ecosystem (vegetation, insects and wildlife) is killed due to a large amount of chemical pollutant or sewage spilling into a large natural area.	Nature killed - pollutants
Neighbourhood parks, trails, creeks and sidewalks are damaged due to soil erosion, making them inaccessible for several months while being repaired.	Sidewalks damaged
The ecosystem (vegetation, insects and wildlife) is destroyed and needs to be replanted, along with vegetation in your yard and neighbourhood parks, playgrounds and greenspaces.	Nature requires restoration
Financial statements	
Res. properties in your neighbourhood are damaged and require repairs. Single family homes have up-to 4-feet of water (basement), condos/apt buildings have up-to 4-feet of water in the basement or lower-level suites.	Res – indoor damage
Low income individuals are unable to afford repairs to their homes without assistance, forcing them to live in a damaged home for several months.	Some can't afford repairs
Your employer's building (or a family member's employer) is temporarily inaccessible until repairs are completed, causing lost wages for a few months.	Work building inaccessible
Homes and properties in your neighbourhood experience serious outdoor damage (e.g. damage to fencing, vehicles, gardens outside the home). Home-owners -out-of-pocket tens of thousands of dollars to replace or fix.	Res - outdoor damage
Local businesses and services (e.g. local mall, recreation centre, businesses you frequent) are forced to close for several months.	Businesses closed
Vehicles in parkades, garages and parking lots in your neighbourhood are damaged due to stormwater getting into the engine. Vehicles and parking areas require repairs taking several months.	Vehicles damaged

MaxDiff: Relative importance score explained

Relative importance scores (Range: 0-100)



Impacts in order of relative importance

Impacts with a higher score hold higher degree of importance in comparison to the other impacts measured

Gaps indicate the degree of importance between values
Look for degree of relative difference between items (e.g., item A is twice as likely to be important as item Q)

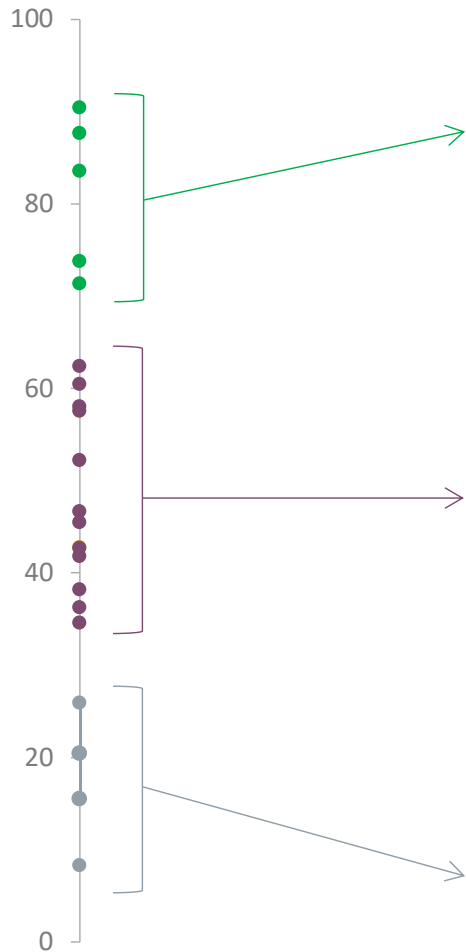
Values in clusters all have relatively similar importance

Scores are not percentages or percentages of respondents selecting an impact

Impacts with a lower score hold higher degree of importance in comparison to the other impacts measured

Relative preference - flood protection

Major impacts



Social	Essential utilities lost	90
Health & Safety	Hospitals forced to close	88
Social	Emerg bldgs damaged	84
Financial	Res - indoor damage	74
Health & Safety	Home - risk of illness	71
Social	Support agencies displaced	62
Financial	Some can't afford repairs	60
Health & Safety	Basement – injury risk	58
Health & Safety	Underpass floods quickly	58
Financial	Work building inaccessible	52
Environment	Garbage clean-up delayed	47
Social	Personal stress	45
Financial	Res - outdoor damage	43
Health & Safety	Street flooded at home	43
Social	Care for friends/family	43
Environment	Nature killed - chem spill	42
Social	Highrise inaccessible	38
Social	Doubled commute time	36
Environment	Nature killed - pollutants	35
Financial	Businesses closed	26
Financial	Vehicles damaged	20
Environment	Nature requires restoration	16
Environment	Sidewalks damaged	8

Higher relative preference for these items

Moderate relative preference for these items

Lower relative preference for these items

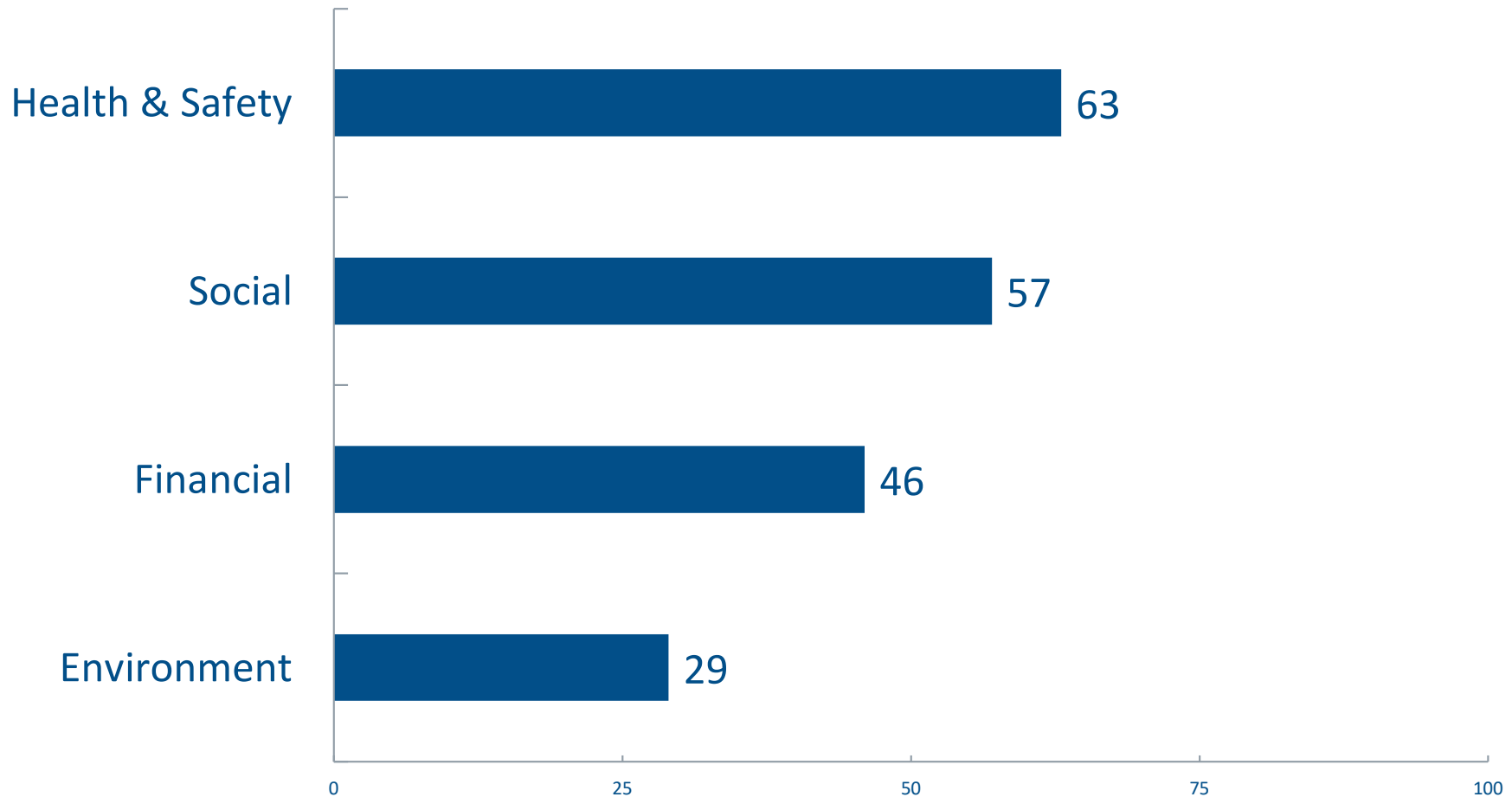
Base: All respondents (n=1,501)

Environmental impacts rank lowest, social highest

Major impacts



Major impacts, by Category*



Base: All respondents (n=1,501) | *NOTE: Categories, as defined by SIRP



Relative Importance Extreme Flood Impacts

SIRP: Flood Mitigation Impacts

Extreme impacts: Guide to the statements & categories

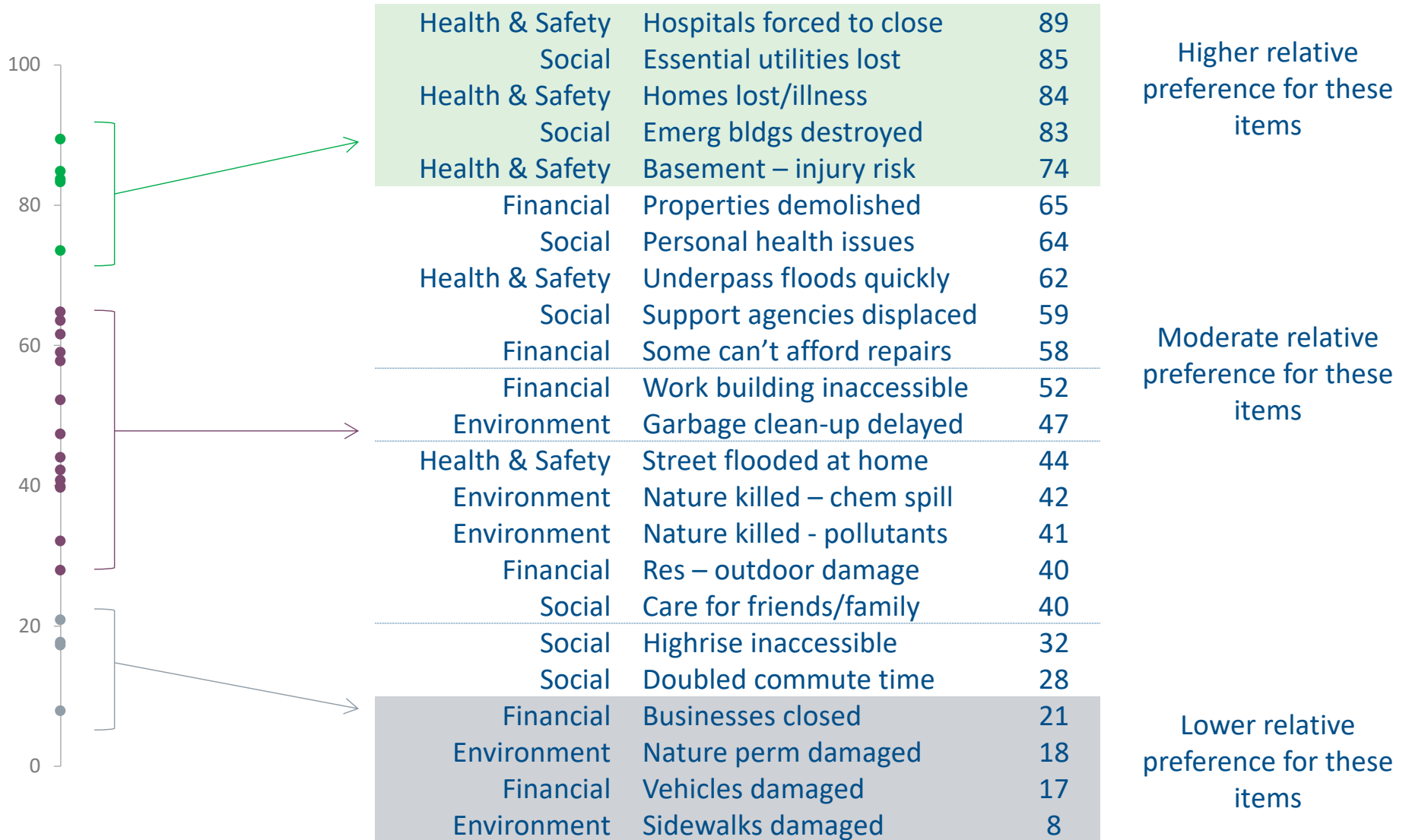
Full statement shown to respondents	Short-form
Health & safety statements	
Due to flooding impacting the building, a local hospital with specialized services is forced to close, forcing surgeries and other critical procedures to be cancelled, resulting in patient deaths or worsened conditions	Hospitals forced to close
The health authority intervenes after increased reports of residents/contractors in neighbourhood falling ill (e.g., respiratory/digestive issues) through prolonged contact with sewage and mold. Homes/dwellings condemned.	Homes lost/illness
Basement flooding to ground level puts residents at risk of drowning/death from not being able to escape to higher ground.	Basement - injury risk
An underpass or parking lot floods at a high rate of speed, causing drowning deaths of people unable to escape their vehicles.	Underpass floods quickly
Stormwater floods streets in your neighbourhood and completely covers your property or lawn, touching the lower walls of your home/building. Access to your location is restricted until the area can be cleaned and sanitized.	Street flooded at home
Social statements	
Your neighbourhood loses an essential utility (such as power, natural gas or drinking water) for upwards of a year. Your neighbourhood is evacuated – at the time of the flood.	Essential utilities lost
Emergency services buildings (police, fire, EMS) are destroyed, and staff and services are relocated, and response times may be impacted. Services from the destroyed building is unavailable for months.	Emerg bldgs destroyed
Agencies that support homeless or vulnerable citizens are temporarily displaced for upwards of a year and unable to get enough essential services they need such as food, shelter or addiction/mental health support.	Support agencies displaced
Family members or close family friends are temporarily displaced from their home, requiring you to care for them or support them for upwards of a year.	Care for friends/family
Major roadways, bridges or transit infrastructure are damaged, doubling your commute to and from your home for upwards of a year.	Doubled commute time
The impacts of flooding cause life-long chronic mental and physical health issues. Some may go on long-term disability as a result of the impacts.	Personal health issues
A high-rise building with offices and residential condos experiences extensive damage, and utilities are unavailable. The building is inaccessible for upwards of a year.	Highrise inaccessible

Extreme impacts: Guide to the statements & categories

Full statement shown to respondents	Short-form
Environmental statements	
Garbage clean-up in your neighbourhood is delayed for upwards of a year due to large amounts of garbage (discarded furniture, household items, damaged drywall – all of which are piling up in yards/sidewalks/roadways).	Garbage clean-up delayed
The ecosystem (vegetation, insects and wildlife) in a major natural area/whole watershed is killed as a result of a flood-related accident involving a truck/train derailment spilling the chemicals, oil or gases it is carrying.	Nature killed - chem spill
The ecosystem (vegetation, insects and wildlife) is killed due to a large amount of chemical pollutant or sewage spilling into the North Saskatchewan River.	Nature killed - pollutants
Neighbourhood parks, trails, creeks and sidewalks are damaged due to soil erosion, making them inaccessible for upwards of a year while being repaired.	Sidewalks damaged
A large natural area is permanently damaged and not able to be replanted, including vegetation in your yard and neighbourhood parks, playgrounds and greenspaces.	Nature perm damaged
Financial statements	
Residential properties in your neighbourhood are so damaged they require demolition (single family homes and condos/apartment buildings).	Properties require demolition
Low income individuals are unable to afford repairs to their homes without assistance, forcing them to leave their homes permanently.	Some can't afford repairs
Your employer's building (or a family member's employer) is temporarily inaccessible until repairs are completed, causing lost wages for upwards of a year.	Work building inaccessible
Homes & properties in your neighbourhood experience serious outdoor damage (e.g. damage to fencing, vehicles, gardens outside the home). Home-owners out-of-pocket hundreds of thousands of dollars to replace/fix.	Res - outdoor damage
Local businesses and services (e.g. local mall, recreation centre, businesses you frequent) are forced to close for upwards of a year.	Businesses closed
Vehicles in parkades/garages/parking lots in your neighbourhood are completely damaged b/c vehicles are entirely submerged in stormwater. Vehicles written off , parking areas require repairs taking upwards of a year.	Vehicles damaged

Relative preference - flood protection

Extreme impacts



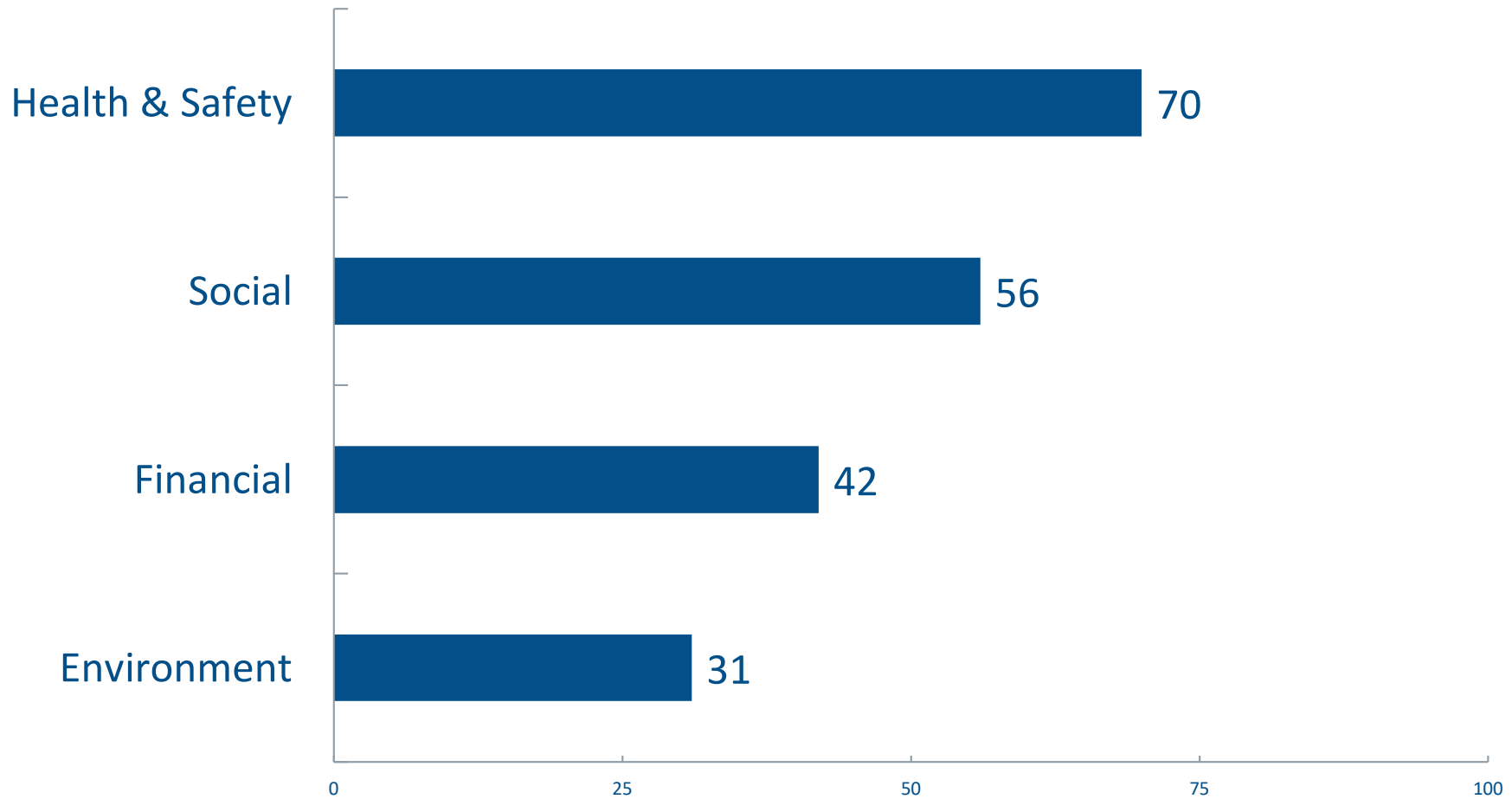
Base: All respondents (n=1,501)

Environmental impacts rank lowest, social highest

Extreme impacts



Extreme impacts, by Category*



Base: All respondents (n=1,501) | *NOTE: Categories, as defined by SIRP



Flood Impacts Demographics, Comparisons & Sentiment

SIRP: Flood Mitigation Impacts

Sentiment



“This survey is among the most difficult to complete that I have ever taken. The ethical calculus necessary to make choices between awful and terrible outcomes was difficult. However, I appreciate Epcor's courage and determination to put these serious and complex questions before the public. We all need to think these things through and contribute to the tough and expensive compromises that lie ahead.”

Relative preference: Major and Extreme impacts

Marginal shifts in relative importance from Major to Extreme

MAJOR IMPACTS				EXTREME IMPACTS			
Social	Essential utilities lost	90	Health & Safety	Hospitals forced to close	89		
Health & Safety	Hospitals forced to close	88	Social	Essential utilities lost	85		
Social	Emerg bldgs damaged	84	Health & Safety	Homes lost/illness	84		
Financial	Res – indoor damage	74	Social	Emerg bldgs destroyed	83		
Health & Safety	Homes - risk of illness	71	Health & Safety	Basement – injury risk ↑	74		
Social	Support agencies displaced	62	Financial	Properties demolished	65		
Financial	Some can't afford repairs	60	Social	Personal health issues ↑	64		
Health & Safety	Basement – injury risk	58	Health & Safety	Underpass floods quickly	62		
Health & Safety	Underpass floods quickly	58	Social	Support agency displaced	59		
Financial	Work building inaccessible	52	Financial	Some can't afford repairs	58		
Environment	Garbage clean-up delayed	47	Financial	Work bldg inaccessible	52		
Social	Personal stress	45	Environment	Garbage clean-up delayed	47		
Financial	Res – outdoor damage	43	Health & Safety	Street flooded at home	44		
Health & Safety	Street flooded at home	43	Environment	Nature killed – chem spill	42		
Social	Care for friends/family	43	Environment	Nature killed - pollutants	41		
Environment	Nature killed – chem spill	42	Financial	Res – outdoor damage	40		
Social	Highrise inaccessible	38	Social	Care for friends/family	40		
Social	Doubled commute time	36	Social	Highrise inaccessible ↓	32		
Environment	Nature killed - pollutants	35	Social	Doubled commute time ↓	28		
Financial	Businesses closed	26	Financial	Businesses closed	21		
Financial	Vehicles damaged	20	Environment	Nature perm damaged	18		
Environment	Nature requires restoration	16	Financial	Vehicles damaged	17		
Environment	Sidewalks damaged	8	Environment	Sidewalks damaged	8		

SUMMARY: Most important impacts to protect (citizen POV)

Top 5: Moderate impacts

Emergency services buildings are damaged – limited access
Essential utility is lost – limited access
Wait times increase at local hospitals/UCC
Risk of illness due to contact with sewage and mold
Support agencies are displaced, unable to get essential services they need

Respondents answered by choosing their top 5

Top 5: Major impacts

Essential utility is lost – limited access
Hospital/UCC is forced to close – turning away all patients
Emergency services buildings are damaged – limited access
Residences experience serious indoor damage – costly repairs
Risk of illness due to contact with sewage and mold

Respondents answered via a choice exercise (MaxDiff)

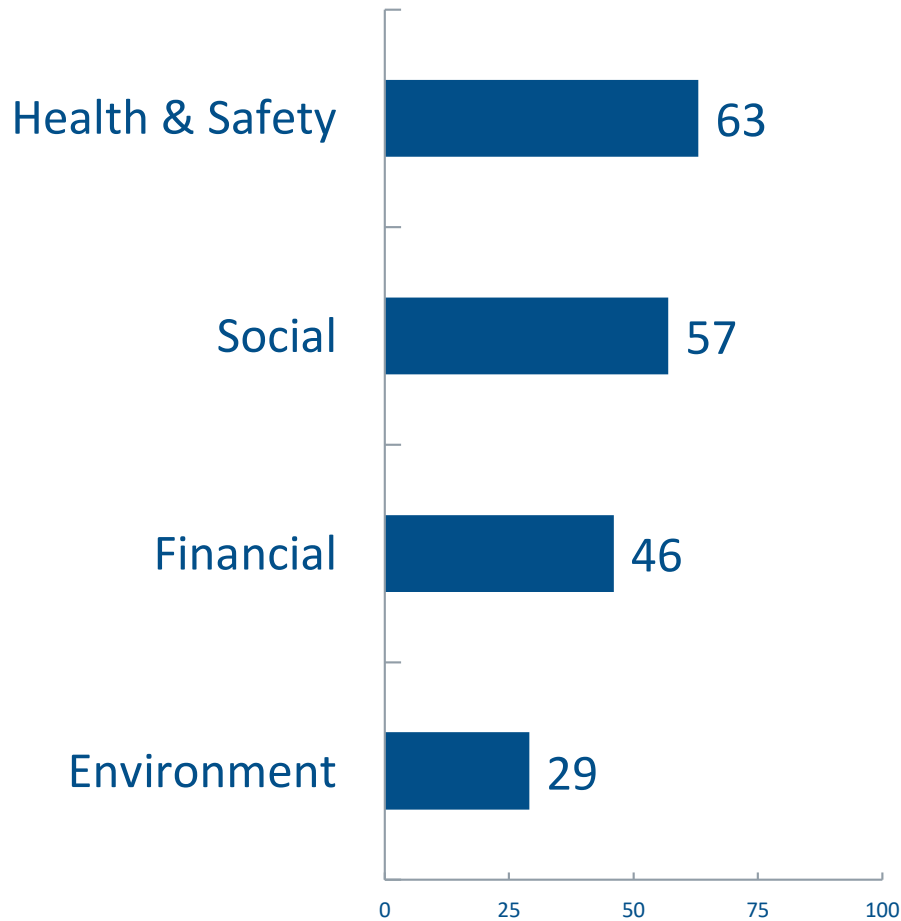
Top 5: Extreme impacts

Hospital/UCC is forced to close – turning away all patients
Essential utility is lost – limited access
Risk of illness due to contact with sewage and mold, homes condemned
Emergency services buildings are destroyed – limited access
Basement - risk of death/injury

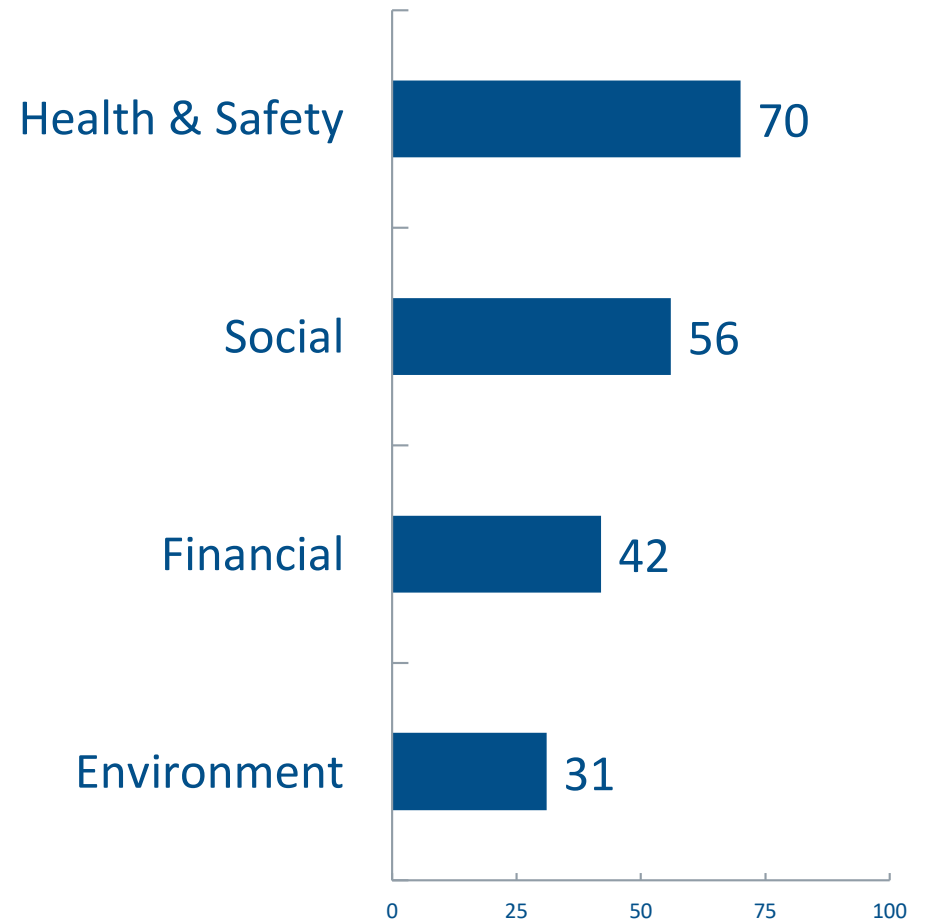
Base: All respondents (n=1,501)

Major & extreme impact categories rank consistently

Major impacts, by Category*



Extreme impacts, by Category*

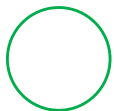


Base: All respondents (n=1,501) | *NOTE: Categories, as defined by SIRP

Priority preferences: Those who use underground parking

As expected, those who park underground place higher importance on high-rise building infrastructure

MAJOR IMPACTS	Park underground (n=280)	Do not park underground (n=1,221)	EXTREME IMPACTS	Park underground (n=280)	Do not park underground (n=1,221)
Financial: Low income - unable to afford repairs without assistance, live in a damaged home	53	63	Social: A high-rise building (offices, residences) experiences extensive damage, and utilities are unavailable - inaccessible for upwards of a year	40	30
Financial: Vehicles in parkades, garages and parking lots are damaged. Vehicles and parking areas require repairs	31	17	Financial: Vehicles in parkades, garages and parking lots are damaged. Vehicles and parking areas require repairs	25	15

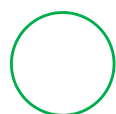


Denote scores that are notably higher

Priority preferences: Neighbourhood type

Impacts to the home are of higher importance to those in established and developing communities

MAJOR IMPACTS	Core (n=108)	Mat. (n=511)	Est. (n=506)	Dev. (n=364)	EXTREME IMPACTS	Core (n=108)	Mat. (n=511)	Est. (n=506)	Dev. (n=364)
Financial: Low income - unable to afford repairs without assistance, live in a damaged home	59	62	64	53	Financial: Low income - unable to afford repairs without assistance, forced to leave	51	61	61	51
Financial: Homes experience serious outdoor damage. Home-owners are out-of-pocket to replace/fix	41	38	42	52	Financial: Homes experience serious outdoor damage. Home-owners are out-of-pocket to replace/fix	43	37	37	46
Health & Safety: Stormwater floods streets - extends onto your property. Access is restricted	40	38	46	46	Health & Safety: Stormwater floods streets - extends onto your property. Access is restricted	39	39	49	46



Denote scores that are notably higher

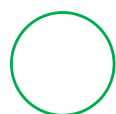


Denote scores that are notably lower

Priority preferences: Dwelling type

As expected, importance score vary for a few key items depending on type of dwelling

MAJOR IMPACTS	Detached (n=810)	Condo/ Apt (n=364)	Semi+ (n=327)	EXTREME IMPACTS	Detached (n=810)	Condo/ Apt (n=364)	Semi+ (n=327)
Health & Safety: Basement flood - risk of injuries	60	51	61	Environment: Garbage clean-up is delayed for upwards of a year due to large amounts of garbage – all of which are piling up in yards, sidewalks and roadways)	50	47	43
Social: A high-rise loses power - inaccessible	35	51	31				
Health & Safety: Flooding extends onto your property. Access is restricted	48	34	43	Health & Safety: Flooding extends onto your property, touches home/building. Access is restricted	48	35	46
Financial: Businesses are forced to close	24	32	23				
Financial: Vehicles in parkades, etc. are damaged – both require repairs	17	26	20				



Denote scores that are notably higher



Denote scores that are notably lower

Suggestions for additional flood prevention and protection

“Is there anything else you feel should be considered when it comes to flood prevention and protection?”

- Many of the additional areas for protection were discussed during the planning stages for the study:
 - Seniors
 - People with disabilities
 - Education facilities
 - Mental health considerations
 - Crime/looting
 - Pets
 - Infrastructure improvements needed
- **Appropriate planning** was brought up by several respondents – ranging from the actions required as a resident for having an emergency plan, through to the responsibilities and government to educate and communicate with citizens (what’s being done, how to be prepared, how to access services, etc.)
- Some mentioned the need to prevent flooding via **building** codes/not building in flood prone areas, developer responsibilities for flood mitigation
- A few brought up:
 - The need for **insurance**/role of the insurance industry to help residents
 - More coordinated efforts across governments and agencies
 - What responsibilities relate back to which level of government
 - The need for better early warning systems when flooding is about to occur
- Several commented, echoing the need to protect people and essential services

Sentiment shared - flood impacts

Backflow devices in all single family homes and proper grading and assistance to homeowners to prevent these occurrences from happening.

I think they are all equal, and should be all saved.

Ability of disabled person's to escape floodwaters and reach higher ground and help. Elevators won't be operational.

Appropriate planning of all infrastructure so that any foreseeable issues from flooding or similar events is mitigated before it happens.

All these impacts are important but I think the long lasting affect on mental health is the most important.

This really made me think. It is hard to choose and I hope I never have to live through these events.

Sentiment shared - flood impacts

This was really hard, a almost no win situation as many things are important you have to see what comes first. Safety of people will always come first, but also to make sure that everything is updated so nothing like a dire flood should affect the city.

Those were tough questions, as all were very important to some people more than others. I was looking at the immediate impact of such a storm & it's results, but the long-term problems are just as important. Some things just have to wait until more urgent things are taken care of.

Where will the evacuees go if they have no family or friends able to support them for a year? Don't forget about the welfare of family pets in disaster situations. This survey is motivating me to clean my basement out.

Disasters are happening every where today as our climate changes, it is good to know that someone here in Edmonton seems to be addressing this matter.

A difficult survey at times-- increases my respect for setting priorities with respect to flood management planning.

Sentiment shared - flood impacts

I am impressed that Epcor is looking at future 'disasters' and making plans to prevent or initiate plans for the city in case of future emergencies.

I feel like the survey went through a lot of important factors, but it was very long and often repeating. It is hard to choose and most important/least important factor when all of the choices are truthfully really important.

Last year we had new sidewalks and roadways put in as part of neighbourhood renewal. In their infinite wisdom, the storm sewer grates were replaced with a new design that backs up constantly causing the road to flood. I have to remove 3 cubic feet or more of debris from each of two sewers after a rainfall. Way to go, City of Edmonton.

There are now computer models available which should allow cities to plan ahead for floods caused by torrential downpours. These flood zones should be identified and residents/businesses etc. informed of the possibility that they will be unprotected in the event.

Sentiment shared - flood impacts

- *The City of Edmonton must fix the pothole problem. We are currently in the summer months of the year and there are still a lot of potholes in our city. Why wait until winter comes? Flood prevention and protection is important but why not fix the pothole problem first?*
- *The City has known about certain areas of the city susceptible to flooding for years and has done little to remedy them. For example, allowing luxurious houses to be built in the River Flats - a flood plain for heaven's sake. Of course flooding is going to be serious there and it's only a matter of time. Look at the various underpasses that flood each time there is heavy rainfall or hail and the city just shakes its head.*
- *Promote the idea of planning/personal responsibility much like the west coast's 72 Hour emergency preparedness campaign: online, in mail boxes and ads. It is important that there is follow through by providing people with checklists and conversation topics so they can start wrapping their head around catastrophic flooding. We can start by calling it what it is: effects of acute climate change. I would also like to see municipalities/provinces be more proactive by implementing water squares, fast draining concrete in flood prone areas like under passes. The technology is out there and goodness knows there is money (we subsidize oil and gas how about public safety), but is there a will?*

Sentiment shared - flood impacts

- *Promotion of emergency kits that allow a household to survive up to 72 hours before help arrives. This allows emergency services to concentrate on critical health and safety issues.*
- *Planning for real estate developments must consider flood risk assessments. Building on a flood plain is, for the lack of a better word, stupid.*
- *Numerous items in the options were actually the responsibility of the province - strong need for inter-jurisdictional coordination and support during such events.*
- *No further housing and expensive buildings in flood planes. I don't just mean the river valley, I also mean McKernan and other flood prone neighbourhoods. Force people to build houses without basements and on stilt in flood areas just like they do along the US gulf coast. No one has a right to live in the river valley or in a flood plane. Politicians lack guts.*
- *Design flood mitigation into new communities, forcing developers to create increased drainage opportunities through innovative design as we continue to reduce the green spaces in new communities.*



Key Findings

SIRP: Flood Mitigation Impacts

Key findings

- **Most important issues:** While climate related issues ranks lower in the list of priorities, the implications from climate change impact many of the top priorities for Edmonton (healthcare, healthcare facilities, safety, affordable housing, etc.)
- **Past flood experience:** Two-in-ten have experienced, during their adult life, a residential flood due to storm/area flooding – with the majority experiencing water in their home for more than 24 hours
- **Relative importance – flood protection:** Across all three (3) levels of impact (moderate, major and extreme) the top factors to protect include those that are life sustaining
 - Emergency services and Emergency service buildings
 - Major utilities
 - Access to the home
 - Risk of illness/death from mold/sewage/water levels
 - Support agencies that help vulnerable populations
- Inanimate objects than can be repaired (vehicles/streets/sidewalks/paths, nature/parks) rank lowest

SUMMARY: Most important impacts to protect

Results were consistent across all three (3) impact levels – moderate, major and extreme. From the citizen point-of-view, respondents want to see life-sustaining infrastructure/services and their home protected first and foremost. Environmental infrastructure rated lowest.

Top 5: Moderate impacts

Emergency services buildings are damaged – limited access
Essential utility is lost – limited access
Wait times increase at local hospitals/UCC
Risk of illness due to contact with sewage and mold
Support agencies are displaced, unable to get essential services they need

Respondents answered by choosing their top 5

Top 5: Major impacts

Essential utility is lost – limited access
Hospital/UCC is forced to close – turning away all patients
Emergency services buildings are damaged – limited access
Residences experience serious indoor damage – costly repairs
Risk of illness due to contact with sewage and mold

Respondents answered via a choice exercise (MaxDiff)

Top 5: Extreme impacts

Hospital/UCC is forced to close – turning away all patients
Essential utility is lost – limited access
Risk of illness due to contact with sewage and mold, homes condemned
Emergency services buildings are destroyed – limited access
Basement - risk of death/injury

Base: All respondents (n=1,501)

Key findings

- Findings are consistent across key variables with a few exceptions:
 - Those who **park underground** and those who reside in apartments tend to place higher importance on protecting
 - > Underground parking areas
 - > High-rise buildings
 - Those who live in a **detached or semi-detached home/townhome** tend to place higher importance on
 - > Protecting the home (water up-to the home, basements, etc.)
 - > Garbage clean-up
- Sentiment suggests many would like to **better understand the softer side of flood protection** – while the study focused on infrastructure protection, comments indicate citizens want to know how flood planning includes ways to help vulnerable populations
- Many respondents were also triggered to consider the role of the City/EPCOR in helping Edmontonians **plan ahead/emergency preparedness** – and well as the role of the City approvals/developers for future development that prevents flooding

A large, stylized graphic of an eye, composed of concentric, curved bands in shades of blue and grey, set against a dark blue background. The eye is oriented horizontally and occupies the right half of the page.

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