Resilient Forests Research Programme

SCION FORESTS PRODUCTS INNOVATION

Risk perception and climate change adaptation: initial survey results using Protection Motivation Theory approach

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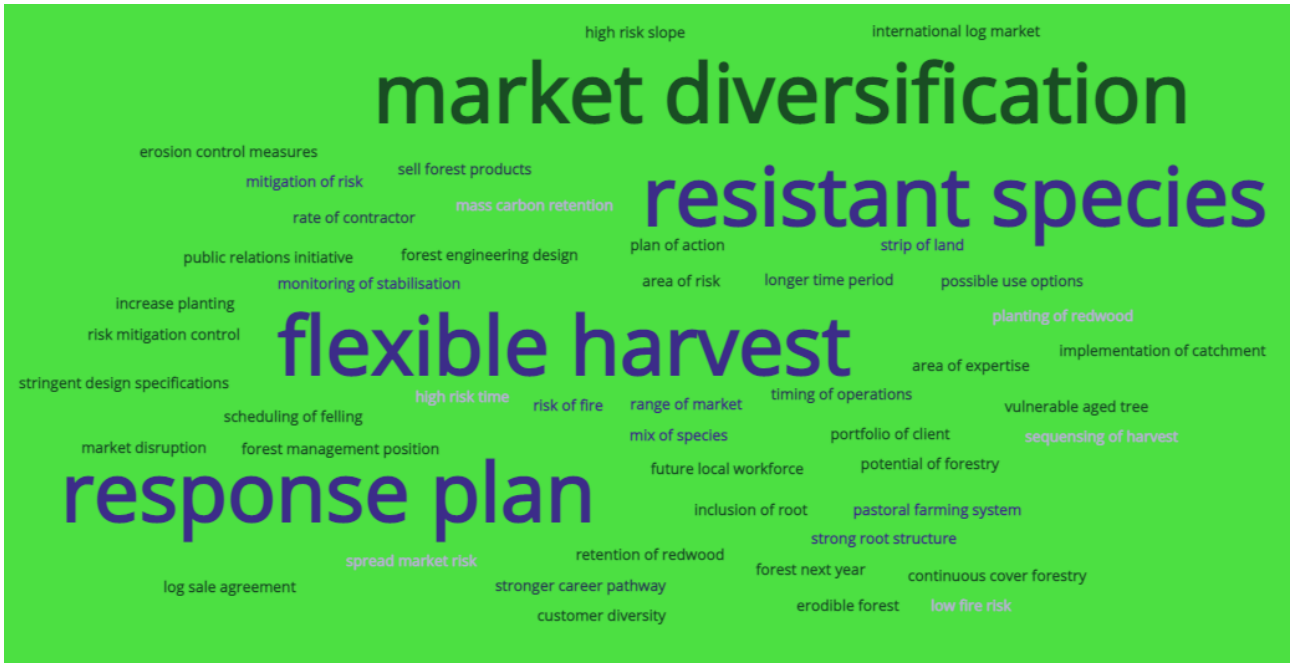

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FOREST GROWERS RESEARCH

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EXECUTIVE SUMMARY

Understanding the perception of forest owners to climate change risks and factors that triggers them to respond to reduce the risks are crucial for effective climate change policy communication.

The aim of this report is to provide the initial (qualitative) result of the Protection Motivation Theory (PMT) framework application through a survey questionnaire targeting forest owners and managers. PMT has been successfully applied in agricultural adaptation behaviour and decisions (Truelove et al., 2015) and has been used as a framework to evaluate stakeholders' perceived severity of climate change consequences, perceived probability of climate change risks and perceived effectiveness of adaptive behaviours to cope with climate change and perceived ability to perform adaptive behaviours (Tapsuwan and Rongrongmuang, 2015). These survey results will be used to answers the research questions such as "What factors determine whether forest owners or managers are willing to overcome barriers to adaptation actions? As well as what factors increase or decrease the likelihood of maladaptation?".

This report provides the baseline information of the factors affecting adaptive and maladaptive behaviours of forest owners and managers. Three key outputs are presented in this paper: (1) forest owners and managers' climate change beliefs; (2) their risk perception/ risk appraisal; and (3) their coping strategies (coping appraisal) as initial outputs from PMT application. This report also provides an overview of the perceived risks by regions, highlighting to policy makers that adaptation strategies and policies should be site-specific.

INTRODUCTION

Risk perception and adaptation to climate change

Adaptation refers to adapting to the expected impacts of climate change and is conceptually closely linked to reduction of the risk of disasters (Moench, 2009). According to the fourth assessment report by the Intergovernmental Panel on Climate Change (IPCC) (Adger et al., 2007), adaptation may be seen as a response to reduce vulnerability where vulnerability to climate change is "the extent to which a natural or social system is susceptible to sustaining damage from climate change" (Schneider et al., 2001, p. 89). To date, understanding how forest owners and managers adapt to climate change remains limited in New Zealand. This includes what they perceive as the most concerned risks associated with climate change. Understanding their perception to climate change risks and factors that triggers a response to reduce the risks are crucial for effective climate change policy communication.

Several studies consider personal assessment of risk as a decisive element in the management of forest ecosystems (Blennow et al., 2014; Seidl et al., 2016). According to Blennow et al. (2012), the strength of belief in local effects of climate change have been strongly correlate to the responses to climate change among private forest owners. Thus, this work focuses on a social-psychological approach in understanding how forest owners adapt to climate change.

Protection Motivation Theory (PMT): conceptual framework

PMT is a framework (**Figure 1**) explicitly addresses both risk (or threat) and adaptation (or coping) (Rogers, 1975). It assumes that fear (or what worries a forest owner) will act as a driving force that motivates adaptation behaviour and decision making towards adaptive practices. PMT has been successfully applied in agricultural adaptation behaviour and decisions (Truelove et al., 2015) and has been used as a framework to evaluate stakeholders' perceived severity of climate change consequences, perceived probability of climate change risks and perceived effectiveness of adaptive behaviours to cope with climate change and perceived ability to perform adaptive behaviours (Tapsuwan and Rongrongmuang, 2015). PMT has a bottom-up approach that measures perceived severity, perceived vulnerability, fear, response efficacy, self-efficacy, response cost and intention of individuals (e.g., forest managers or owners as decision makers). PMT is made up of two components or appraisals:

I. **Threat/risk appraisal** focuses on the source of the threat and factors that increase or decrease the probability or likelihood of making maladaptive responses (e.g., avoidance, denial, wishful thinking). The risk of the threat (or exposure) is estimated by the likelihood of the threat occurring, and the severity should it occur. It assumes that the probability of engaging in risk reduction behaviours is a positive function of the amount of risk they perceive.

   (Hypothesis 1): *If threat is high >, then, people engage in protection motivation*

II. **Coping/ adaptation** appraisal focuses on the coping responses available to the individual to deal with the threat and factors that increase or decrease the probability or likelihood of making adaptive responses. The extent to which they can cope with the threat is evaluated by assessing their capability of acting (self-efficacy) and the anticipated effectiveness of the action in reducing the threat (response efficacy). **Self-efficacy** is defined as one's perception of how competent he or she is in organising and executing actions needed to manage a risky situation (whether a person feels able to implement a certain measure). For example, practical guidelines on how to deploy adaptation measures. According to Blennow et al. (2012), self-efficacy or adaptive capacity is an individual phenomenon that either promotes or hinders adaptive action. **Response efficacy** refers to one's belief that recommended behaviours will be effective in reducing or eliminating risk (*whether a person considers a protective measure as effective to reduce a certain risk*). For example, risk communication

emphasising the effectiveness of flood mitigation measures. **Response costs** refers to the perceived costs associated with protection actions such as financial costs, time, effort and emotional costs.

(Hypothesis 2): *If coping capability with threat is high > then, people engage in protection action*
(Hypothesis 3): *If coping capability with threat is low > then, maladaptation action takes place*

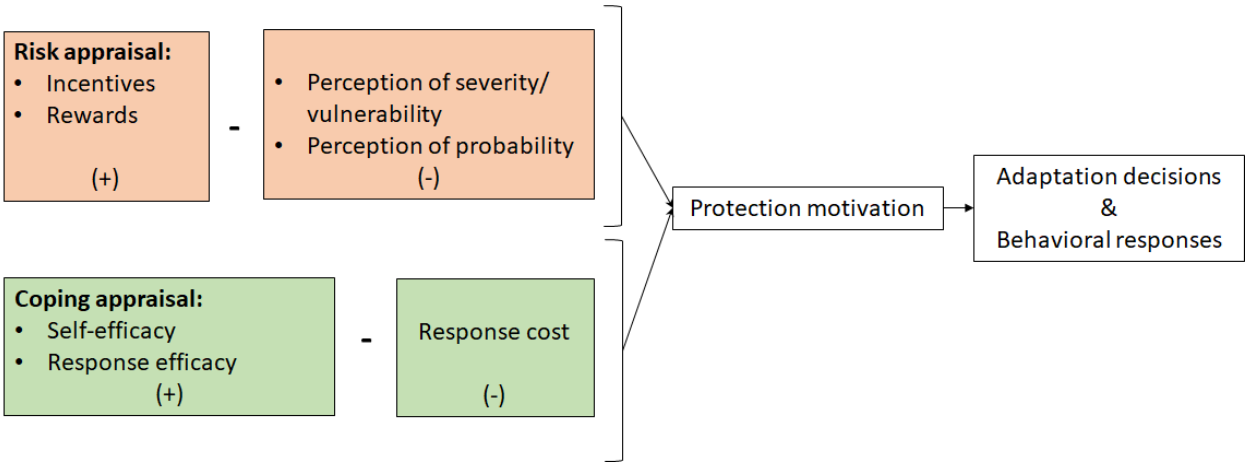


Figure 1 Protective Motivation Theory [modified from (Grothmann and Patt, 2005); Truelove et al. (2015)]

According to McEligot et al. (2019), the initial steps of a threat appraisal are considered to be like a traditional risk assessment based upon perceived hazard probability and consequences; whereas a coping appraisal is more like a cost-benefit analysis utilising the decision maker's perception of their self-efficacy (i.e., ability to affect the response), response efficacy (i.e., the responses' ability to mitigate the risk) and response cost. Protective measures (or adaptation responses) are those actions that are suitable to reduce the threat and are adopted if high risk perceptions are accompanied by (positive) coping appraisals. In contrast, non-protective (or maladaptation) responses are adopted if high risks perceptions are accompanied by low rated coping appraisals (e.g., wishful thinking, avoidance or denial, which can help to suppress negative emotions caused by the cognitive dissonance of high-risk perceptions and low coping appraisals).

PMT framework is applied in this context in this study to answer the following questions: "What factors determine whether forest owner or manager are willing to overcome barriers to adaptation actions? As well as what factors increase or decrease the likelihood of maladaptation?"

The aim of this study is to generate the key components and factors of the PMT framework through survey questionnaire in order to assess what influences the forest owners and managers to engage in protection action or risk- reduction responses, We also explore the adaptation strategies that they are aware of according to their perceived risks.

METHODS

We designed a questionnaire to determine the perceptions and behaviours of private forest owners, forest managers, forest consultants and farmers (with trees) in New Zealand in relation to climate change and in the context of PMT **(Appendix 1)**. Among the questions asked were (**Table 1** provides the link to PMT framework):

- their personal beliefs in the local effects of climate change (*severity, probability, and vulnerability)*;
- their risk perception and behaviour associated with climate change (*risk perception, inaction, avoidance and postponement*);
- whether these respondents had adapted to reduce impacts of climate change (*coping appraisal*),
- their confidence that their proposed adaptation strategies or measures will reduce the negative effects (*self-efficacy, response efficacy and cost-effectiveness*)**.**

Table 1. Sample questions linking the PMT framework.

Factors	Conceptual definition (Ghanian et al., 2020)[1]	Operational definition example
Risk perception	Risk perception - people's knowledge performance through information flow, which helps to foster adaptive actions in responding to the consequences of climate change	- Climate change will lead to an increase in forest pests and diseases. - Climate change will result in poorer wood quality in New Zealand.
	Risk vulnerability is defined as the likelihood of harm to property (i.e. plantation) and self if there is no change in behaviour (Martin et al., 2007)	Measured using a 5-point Likert scales by asking "how vulnerable do you feel about the possibility of a e.g., pest outbreak physically affecting you and your property" anchored by 1 = not at all vulnerable to 5 = extremely vulnerable
	Risk severity is defined as the amount of hardship that would occur if one experienced the risk.	Measured using a 5-point Likert scales by asking "how severe will the impact of pest outbreak be where your plantations located" anchored by 1 = not at all serious/ no harm at all to 5 = extremely serious/ extremely devastating
Maladaptation	Describes as an action that results in an undesirable and unintended outcome	- There is no need for action to be taken in the face of climate change, because these actions will not make any difference. - Climate change is not a big challenge, and human inventiveness will be able to cope with it.
Self-efficacy	Self-efficacy is defined as one's perception of how competent he or she is in organizing and executing actions needed to manage a risky situation (whether a person feels able to	By measuring how confident respondent felt about their ability to protect their property from the risk. Question asked such as: "how confident do you feel in your ability to do the following risk reduction behaviours"? 1 = not at all confident to 5 = very confident

[1] Measured by asking farmers to what extent they agreed based on 5-point Likert scales ranged from 1 (strongly disagree) to 5 (strongly agree) for all items.

Factors	Conceptual definition (Ghanian et al., 2020)[1]	Operational definition example
	implement a certain measure)	
Response efficacy	Response efficacy refers to one's belief that recommended behaviours will be effective in reducing or eliminating risk (whether a person considers a protective measure as effective to reduce a certain risk)	What perceived to be effective at reducing a particular risk. Question asked such as "How confident are you that your strategy will be help reduce the risk?" anchored by 1 = not at all effective and 5 = very effective

We also included questions related to risk behaviour (e.g., postponement, avoidance and inaction). In addition, we sought socio-demographic information on respondents' gender, level of education, regional location and size of holding. The questionnaires were distributed online (i.e., survey monkey from 3 Mar to 3 May 2021) and a paper-based form was disseminated during the New Zealand Farm Forestry Conference on 11 March 2021. This questionnaire was accompanied by a cover letter explaining the objectives of the study and for what purpose the collected data will be used. Completed questionnaires were returned voluntarily by the respondents. Data were analysed using descriptive statistics.

RESULTS AND DISCUSSION

Respondents characteristics

A total of 56 respondents completed the questionnaire, of which 41 were online and 15 from the conference (**Figure 2a**). The Bay of Plenty was the largest single region in terms of respondents with reasonably even representation across all other regions except the West Coast (**Figure 2b**).

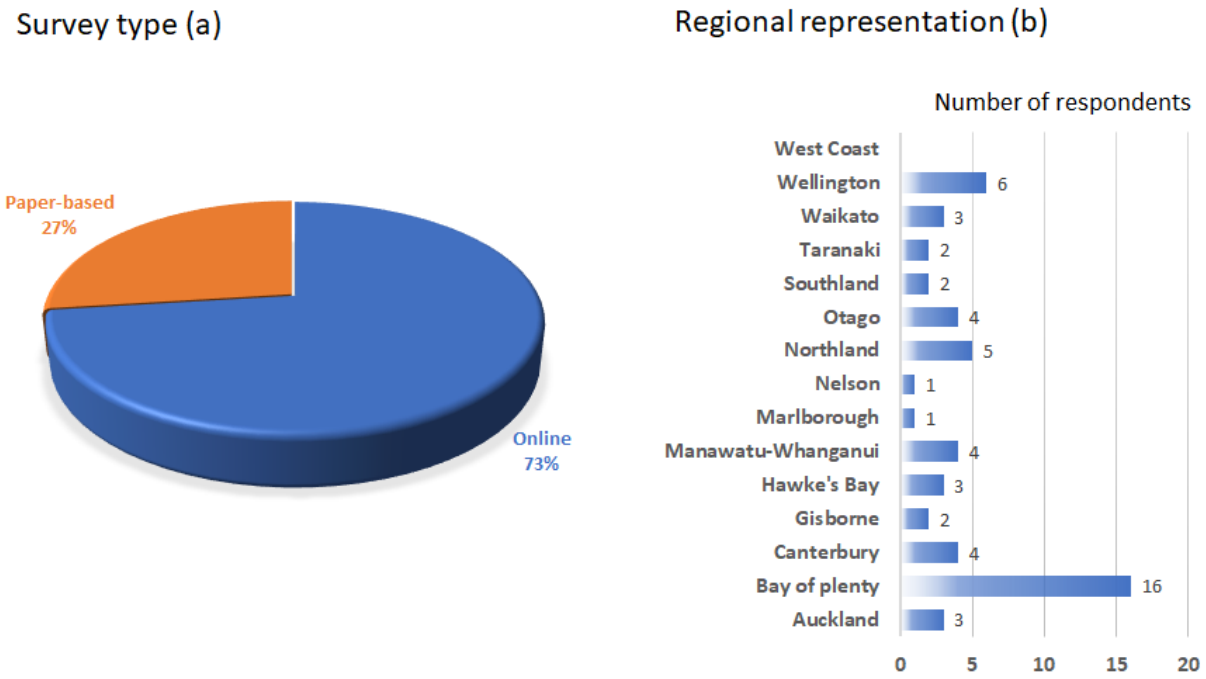


Figure 2. Questionnaire distribution type (a) and regional representation of respondents (b).

In terms of socio-demographic characteristics of the respondents, **Figures 3a, b, & c**, represent the age distribution, level of education and gender. More than half of the respondents are between 45 and 64 years of age; 40% of the total respondents have a Bachelor of Science degree and a third of them are highly educated. The majority of the respondents are males.

Some respondents have two or three roles at the same time. About 36% of them are forest managers working for large-scale companies (representing more than 70% of the New Zealand large-scale forest companies); 20% of the respondents are forest consultants both for small- and large-scale forest companies; 35% of them are forest owners, and the rest are farmers (9%) who planted trees on their farms and or recently harvested their trees (**Figure 3d**). **Table 2** represents the distribution of respondents based on categorization suggested by NEFD (2019).

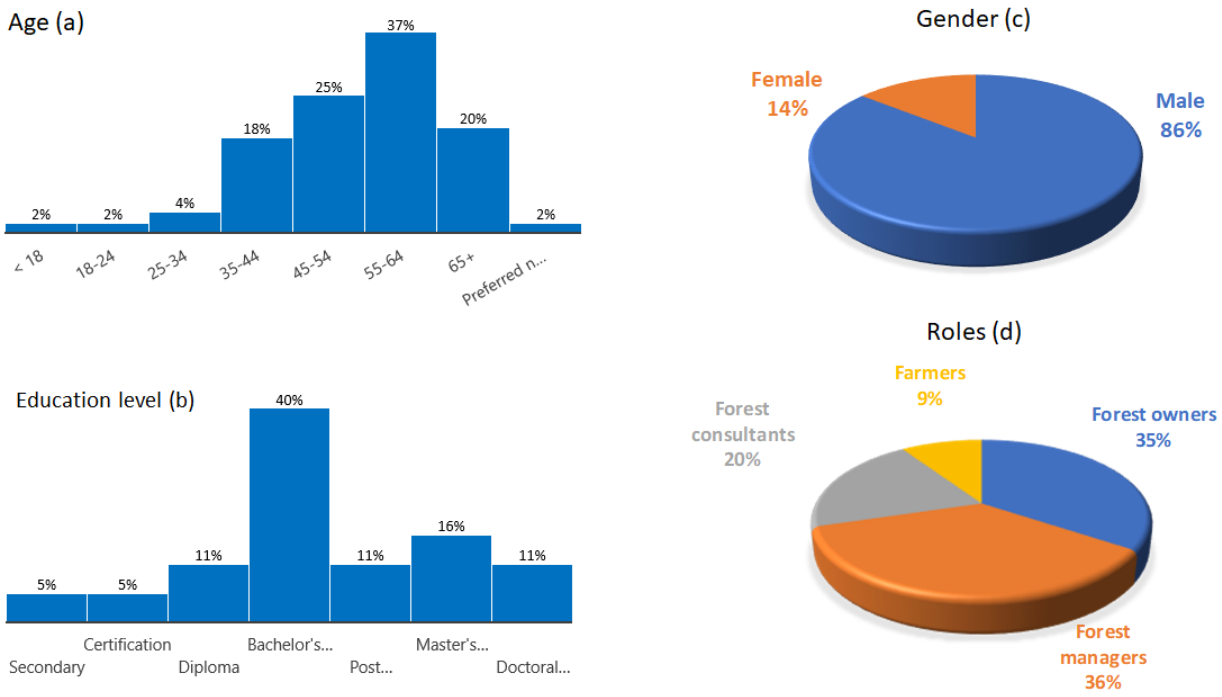


Figure 3. Socio-demographic characteristics of the respondents such as age (a), education level (b), gender (c), and roles (d).

Table 2. Descriptive statistics of respondents by scale of forestry operations.

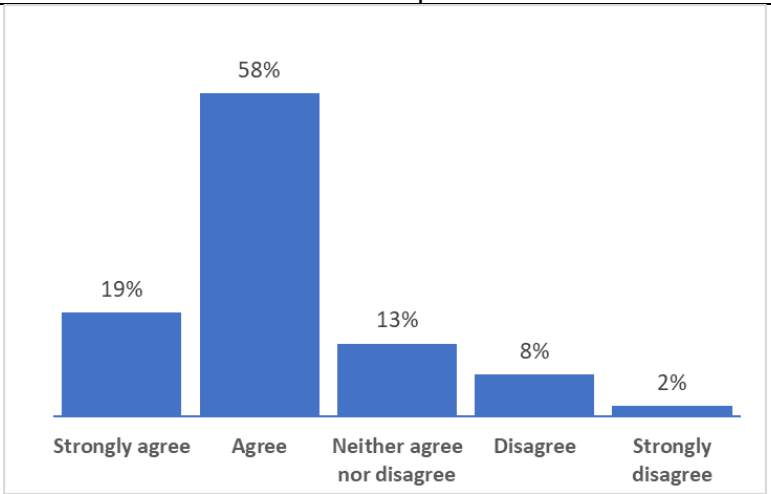
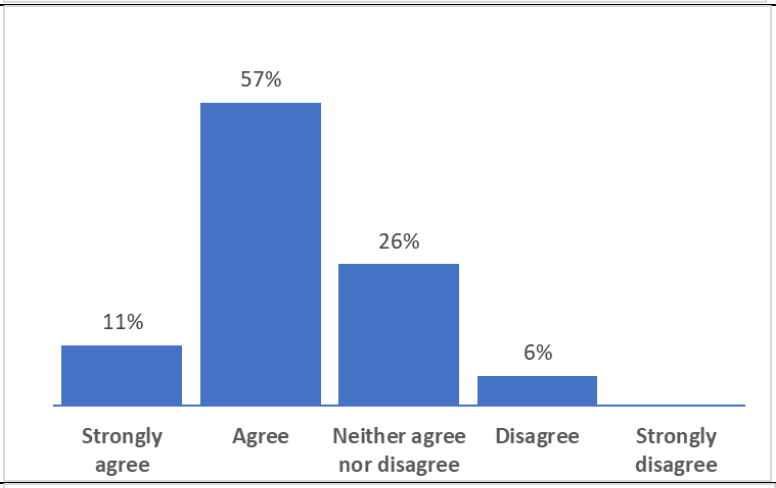
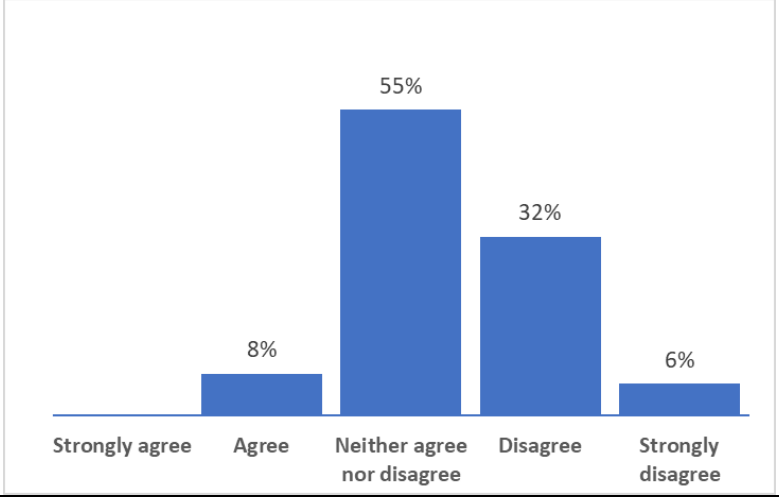
Scale	Roles				Gender		Net stock landholding (ha)			Forestry expe-rience (years)
	Forest owner	Forest manager	Forest consultant	Farmer	Male	Female	Mean	Min	Max	
Small [a]	9	1	2	4	12	3	13	4	40	30
Medium [b]	9	2	1	2	10	0	395	110	1000	47
Large [c]	3	18	1	0	19	1	+54125	5000	+200000	21
Total	21	21	4	6	41	4				

Note: [a] <40 ha; [b] <1000 - >40 ha; [c] >200,000 - >1000 ha

Climate change beliefs and perception

Table 3 summarises the beliefs of the respondents on the effect of climate change in terms of the increase of pests and diseases, wood quality, growth and productivity, wildfire and their lifestyles.

Table 3. Climate beliefs of respondents

Beliefs	Response
1. My forests will be affected by climate change.	
2. Climate change will lead to an increase in forest pests and diseases.	
3. Climate change will result in poorer wood quality.	

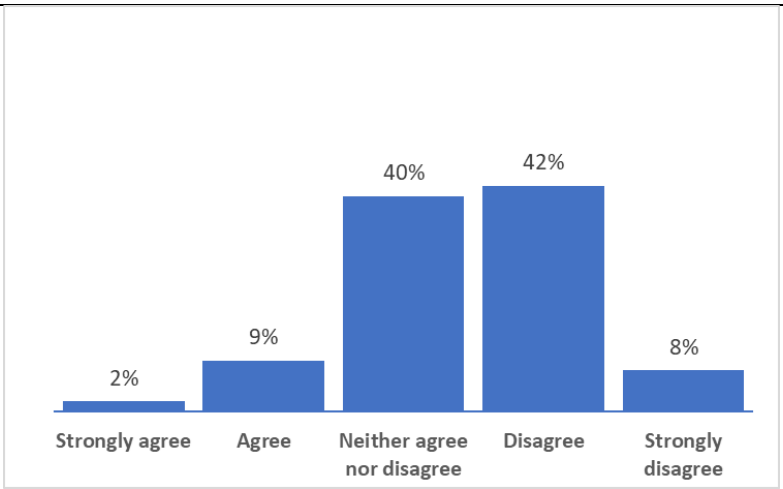
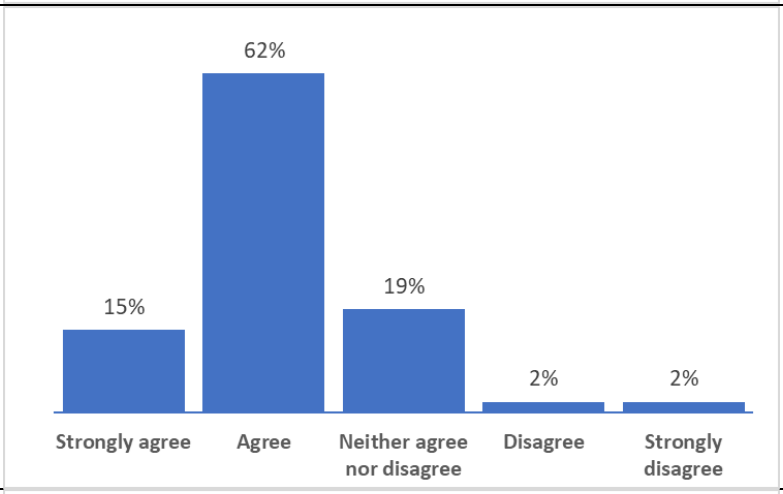
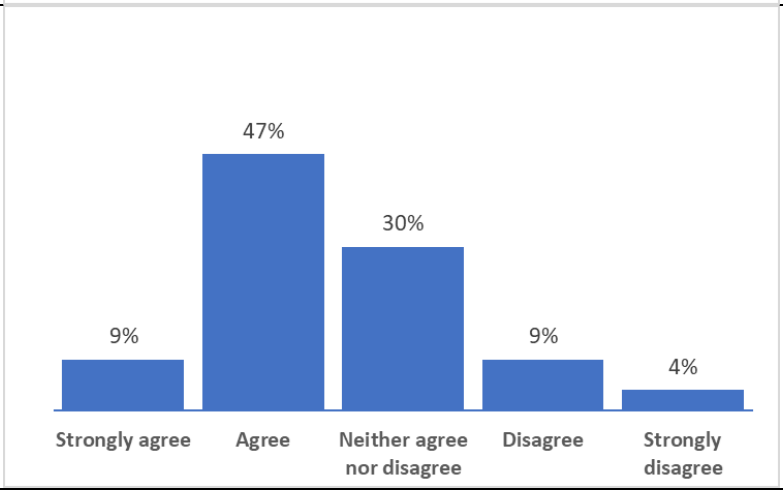
4. Climate change will reduce tree growth /productivity in New Zealand.	
5. Climate change will increase the frequency and severity of rural wildfires.	
6. Climate change will change my lifestyle.	

Table 3 shows that there is a clear agreement among the forest owners and managers that climate change will increase incidences of wildfires and pest and diseases outbreaks. With regards to the effect of climate change on wood quality and forest growth, there is more disagreement.

Risk appraisal

When asked about worries and forest risks, respondents ranked the top five risks in the next 5 years (**Figure 4**). Market disruption due to climate change is the highest rank. Windthrow and wind damage ranked 2 and forest fires ranked 3.

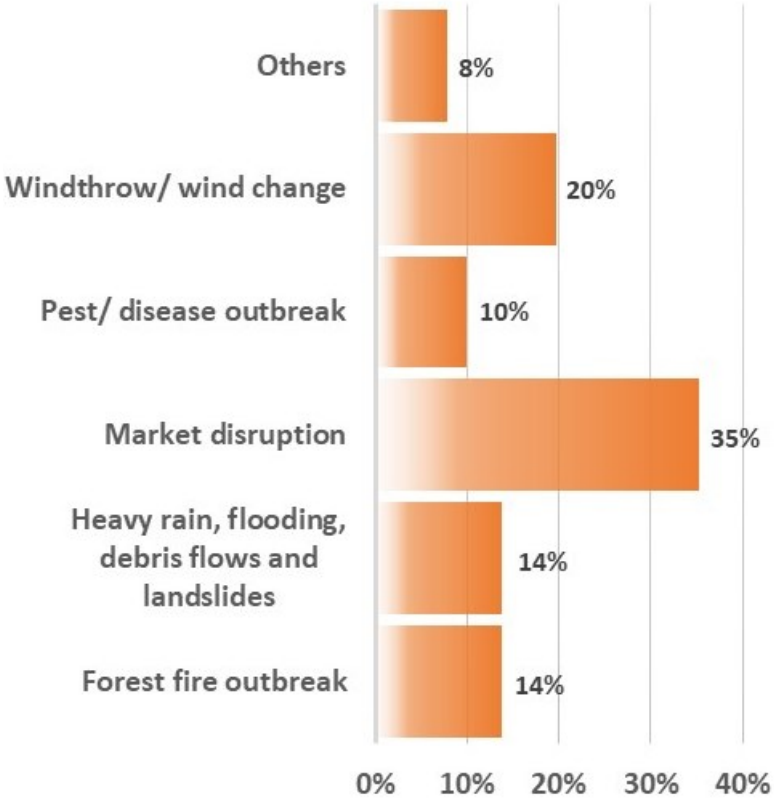


Figure 4. Perceived risks due to climate change.

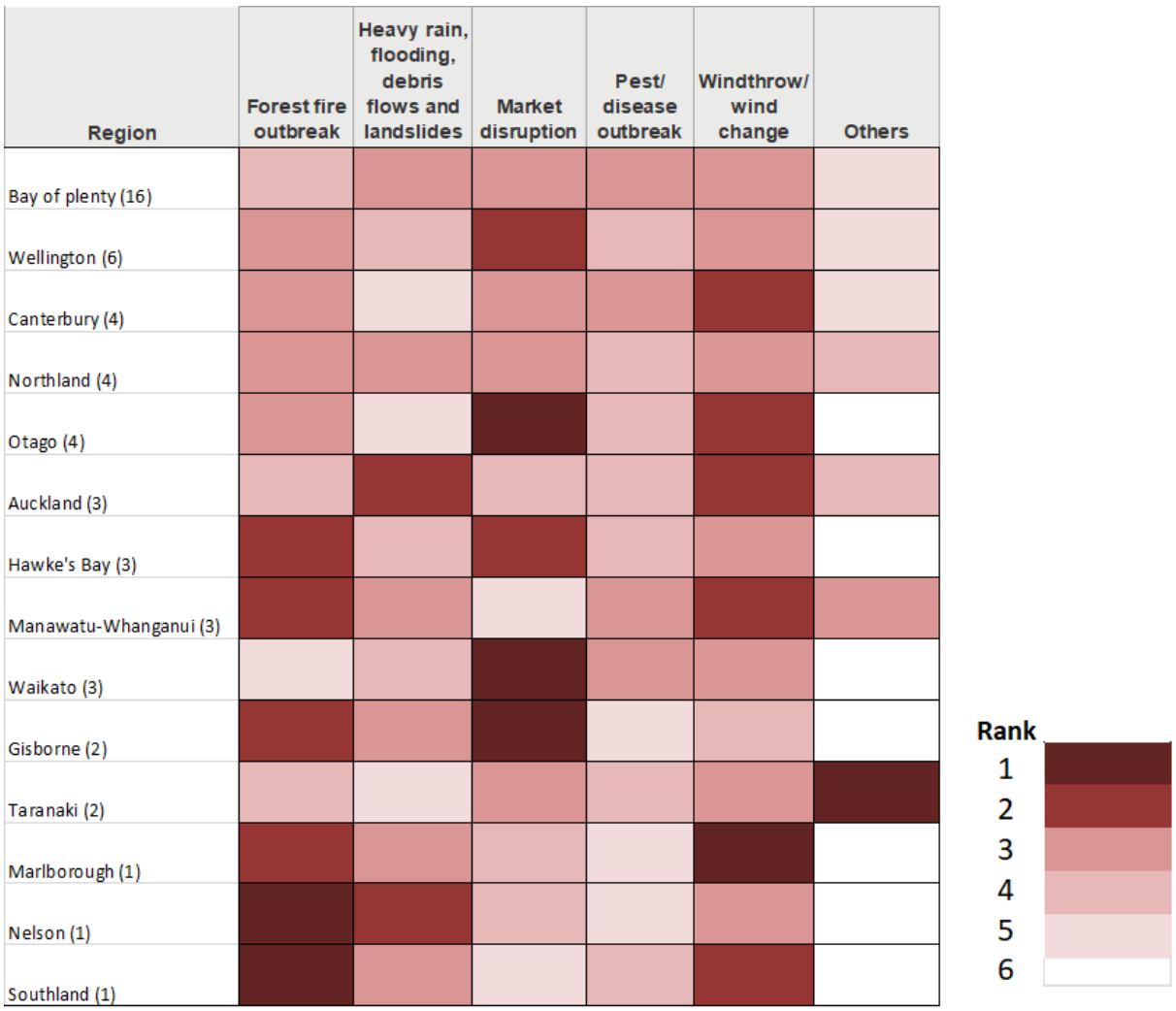
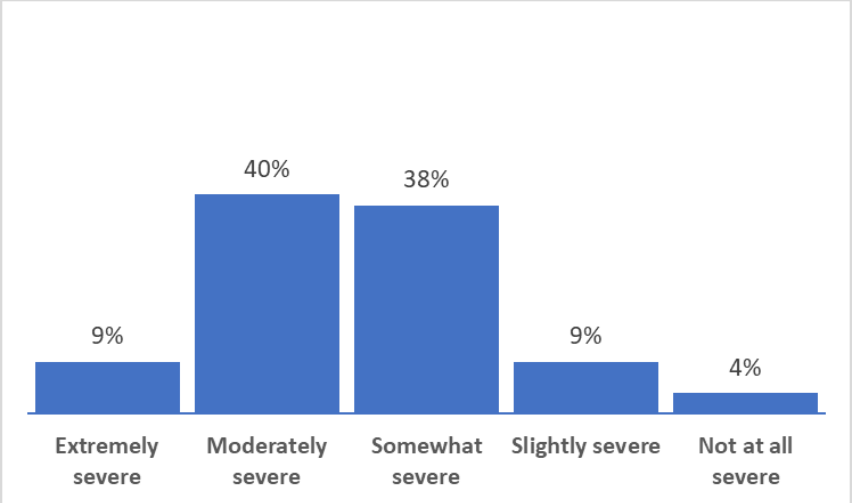
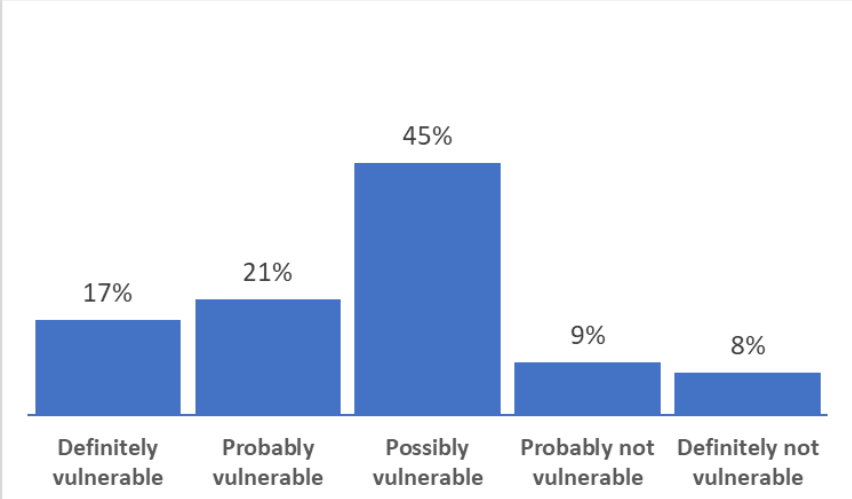
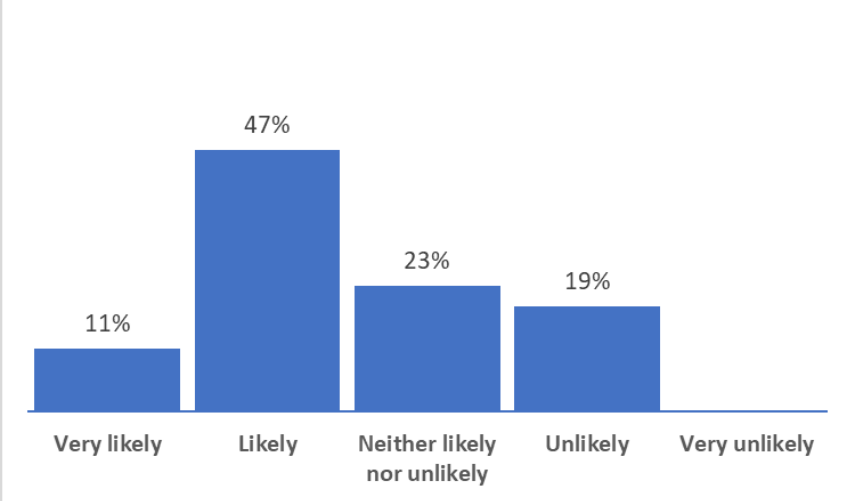


Figure 5. Perceived risks by regions (Note: numbers in regions corresponds to the number of respondents)

The risk perception of the respondents varies according to regions**. Figure 5** provides an overview of the regional differences in terms of perceived risks. For example, respondents from Wellington perceived market disruption brought about by climate change is what worries them most, whereas windthrow/wind damage is the biggest concern for respondents from Canterbury. Among the regions that perceived market disruption as the greatest concern are Gisborne, Marlborough, Otago, Waikato and Wellington. This suggests that specific regions require specific regional (or local) level of adaptation response to climate change.

According to PMT, if the threat is high, then people engage in protection motivation. The specific indicators such as perceived severity and their vulnerability and the likelihood that the threat will occur presented in **Table 4** provide insights of the level of threat.

Table 4. Perceived severity, vulnerability and probability for risk appraisal

Indicator	Response
1. Severity	
2. Vulnerability	
3. Probability (*likelihood*)	

Coping/adaptation appraisal

Of the total 56 respondents, 52% of them expressed that they have had taken measures *directly and indirectly* measures to adapt to climate change impacts on their forests (**Figure 6**).

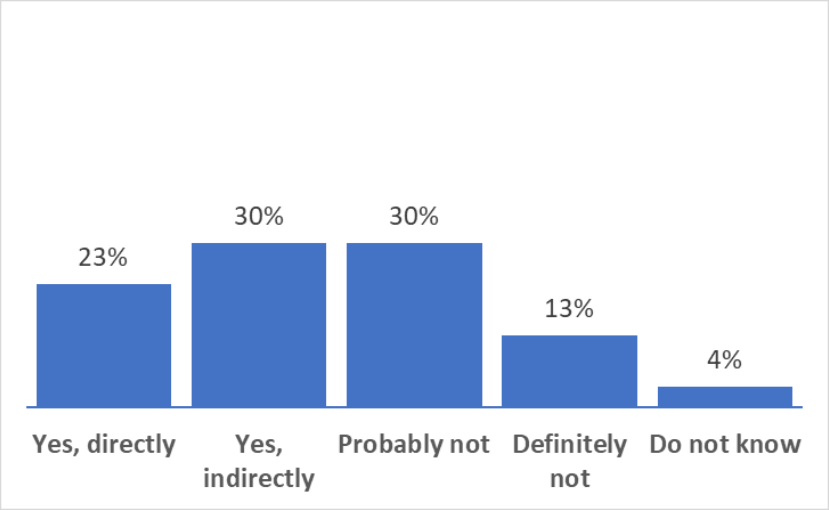


Figure 6. Percentage of respondents who have taken measures to adapt to climate change impacts on their forests.

Table 5 lists all the adaptation strategies or measures to reduce the negative impact of climate change as identified by forest owners and managers according to specific risks. The strategies/ plans vary from highly technical to practical measures. Other respondents perceive the risks beyond their control.

Table 5. Adaptation strategies and practices to reduce climate related risks identified by the respondents

Risks	Tally	Adaptation strategies/ Practices to reduce/manage/avoid
Market	1	Labour supply and cost management
	1	Develop awareness of the issue and learn more
	1	Non-contiguous blocks with irrigated farmland between
	1	Maintain access to a range of markets, both domestic & export
	1	Ensuring that forest management is resilient and sustainable into the future
	1	Diversify markets and forests; Establish resilient genetics
	1	Risk mitigation controls in place
	1	Diversify as practicable
	1	Maintain options. Spread market risk. Work for a diverse portfolio of clients
	1	Maintain domestic supply/customers and diversify markets in Asia.
	3	Market diversification. Flexible harvest.
	1	Maintain and expand market diversity
	1	Manage accordingly, stop logging, stop planting
	3	Beyond my control/ do nothing
N	***18***	
Windthrow/ wind damage	2	It's not possible to mitigate windthrow/ do nothing
	1	Plant more wind tolerant/resistant species.
	1	Regime choice, timing of operations, planting stock control and where to plant (site factors)
	1	Sell forest products periodically, not grow the rotation out too long
	1	Establishment and thinning practice will be modified
	1	Better sequencing of harvest to not expose vulnerable aged trees; Plant wind hardly species

	1	Replanting with fast growing species as shelterbelts
	1	There is nothing that can be done. Windthrow results in harvesting
	1	Keep the trees as strong and healthy as possible; Make sure thinning is done early and not left too late
N	***10***	
Forest fires	1	4 R's focusing mainly on response plans
	1	Management strategies around high-risk times. Preparedness and response.
	1	Clear strip of land around perimeter to minimize risk of fire reaching forest, plant dense crops to help prevent moisture loss
	1	Manage fires on site. Setbacks. Fire resistant species
	1	Redesigning plantation layout to put low fire risk, pruned spaced plantations
	1	Fire preparedness
	2	Do nothing
N	***8***	
Heavy rains/ flooding, debris flows & landslides	1	Retire high risk slopes
	1	Felling the forest (next year) so not a priority
	1	Improvements in engineering standards, implementation of catchment constraints in harvest planning; Species change. Support of genetic improvement; silvicultural review
	1	Proper scheduling of felling, erosion control measures, improving ground cover
	1	Thorough forest engineering design, with particular attention to identification and mitigation of risks - catchment dynamics, landslides, debris flows
	1	Increase planting of redwood with strong root structure
	1	Do nothing
N	***7***	
Pest/disease outbreak	1	Continue to invest in and work to prevent or reduce biosecurity risks at the national level
	1	Biosecurity monitoring, training, maintain healthy forest, attend Biosecurity committee/workshops/ research and have response plans in place
	1	Grow a mix of species, exotic and indigenous; include preventive measures for visitors, etc.
	1	Creating a resilient *ngahere* - using continuous cover forestry rather than clear fell, pest and weed control, ensuring our forests are species diverse and complex (not monoculture) using eco-sourcing and ensuring genetic diversity is maximised
	1	Culling badly affected trees; replanting with resistant varieties
N	***5***	
Others:		
Social license to operate	1	Support industry level public relations initiatives
Government rules changes & indecisions	1	Push for MPI inclusion of root mass carbon retention of Redwood; post-harvest to give real credibility to tables
Labour shortage	1	Increase rates of contractors; increase training; implement education/communication with future local workforce; increase recognition
Total	**51**	

Using a word cloud, **Figure 7** identifies the most common strategy or response to reduce, manage and/or avoid the effects of climate change. Four of the phrases stand out. They are, market diversification, resistant species, flexible harvest and response plan, suggesting that these are most proposed strategy considered in response to the perceived risks.

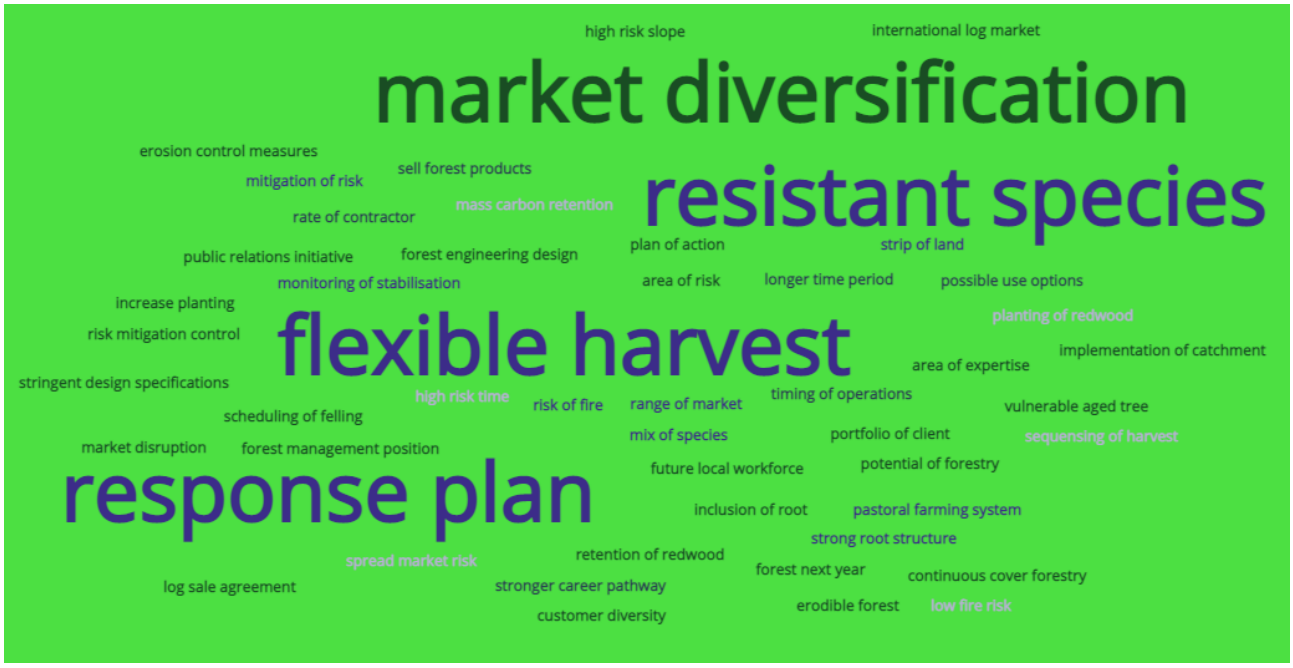
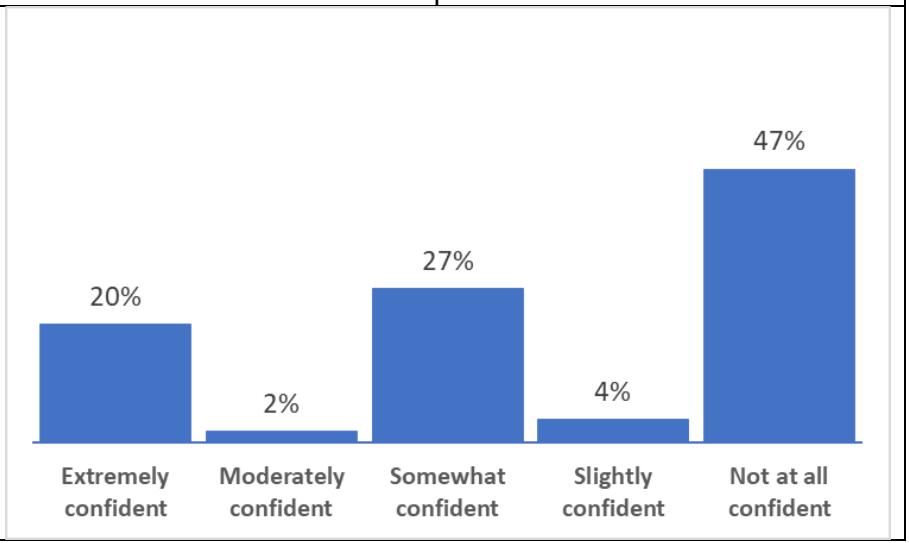
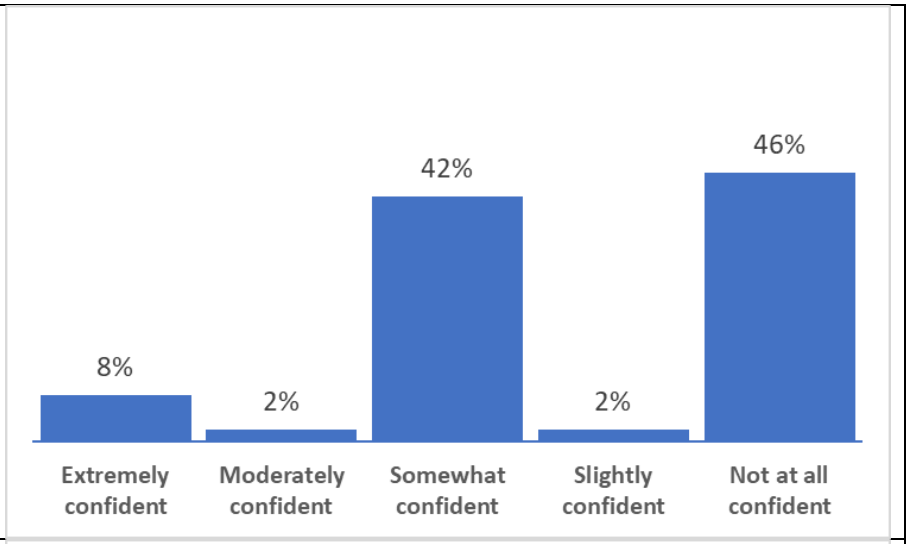
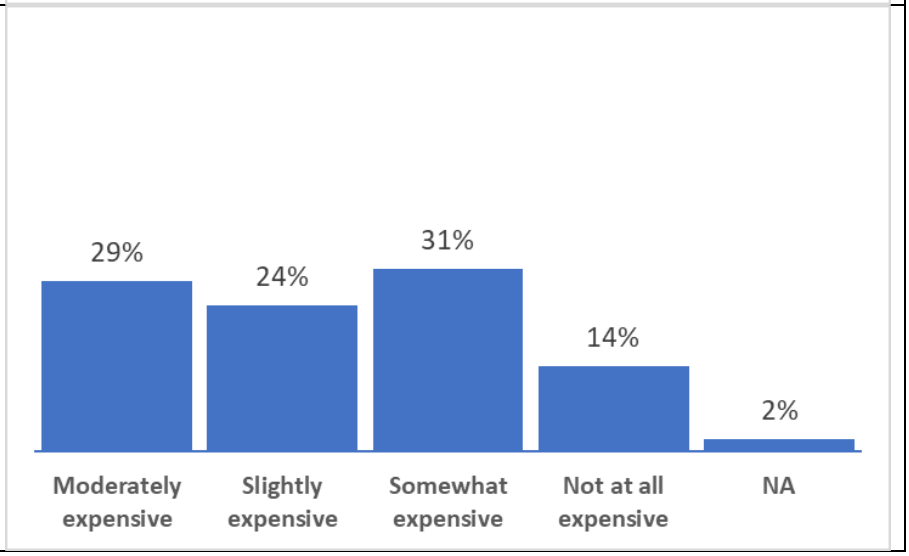


Figure 7. Word cloud of measures/strategies and plans.

Based on the PMT framework, the coping response of forest owners can be evaluated based on its response efficacy, self-efficacy and response cost. **Table 6** summarises how respondents perceived their proposed strategies/measures (**Table 5**) according to the PMT indicators.

Table 6. Key indicators affecting coping with risks

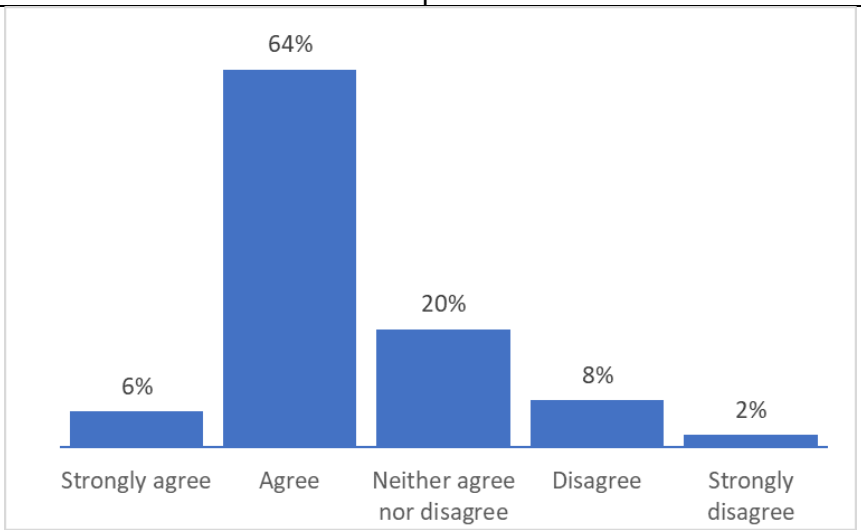
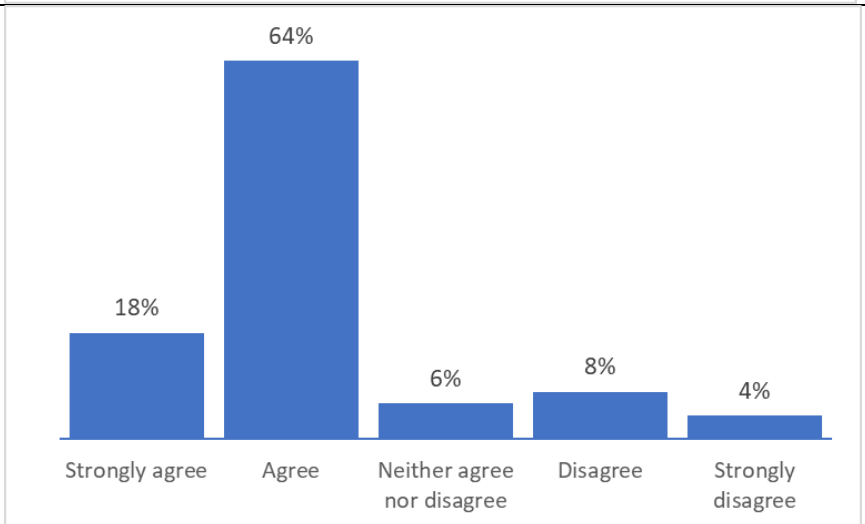
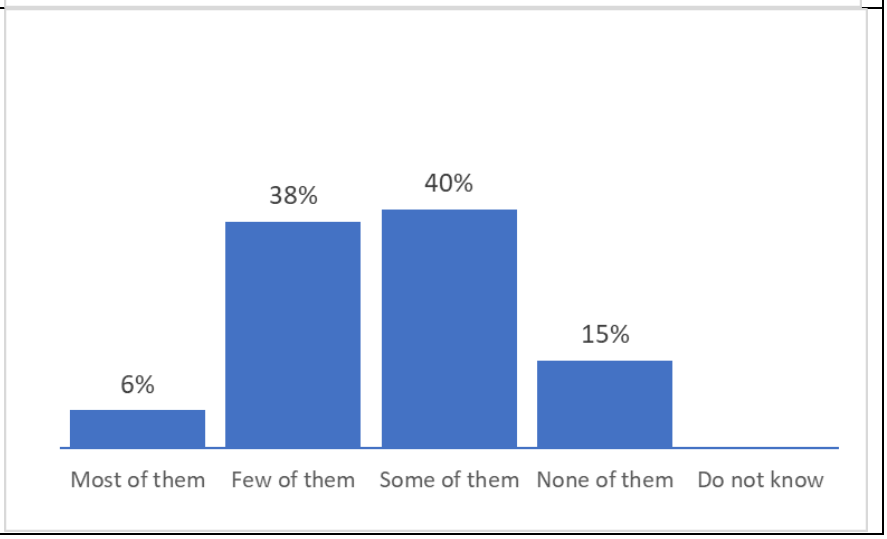
Indicators	Response
Response efficacy	

Self-efficacy	
Cost-effectiveness	

Incentives and social environment

Incentives and social influences are also important factors associated with the effectiveness of the adaptation strategies. **Table 7** presents how respondents perceive climate-risk information and warnings made by official authorities and how research can improve their adaptation to climate change as well as how the social environment influences them.

Table 7. Perceived incentive and social environment.

Beliefs	Response
1. Climate-related risks information and warning from official authorities will improve forest owners' capacity to adapt to climate change.	
2. Research on climate resilient tree species or better adapted genetic tree species will improve forest owners' capacity to adapt to climate change.	
3. Neighbours or friends have implemented risk reduction measures.	

Maladaptation behaviour and barriers to adaptation

Table 8 presents the behavioural factors such as inaction, postponement and avoidance that will lead to maladaptation whereas **Table 9** shows the perceived barriers to climate change adaptation.

Table 8. Perceived maladaptive behaviour.

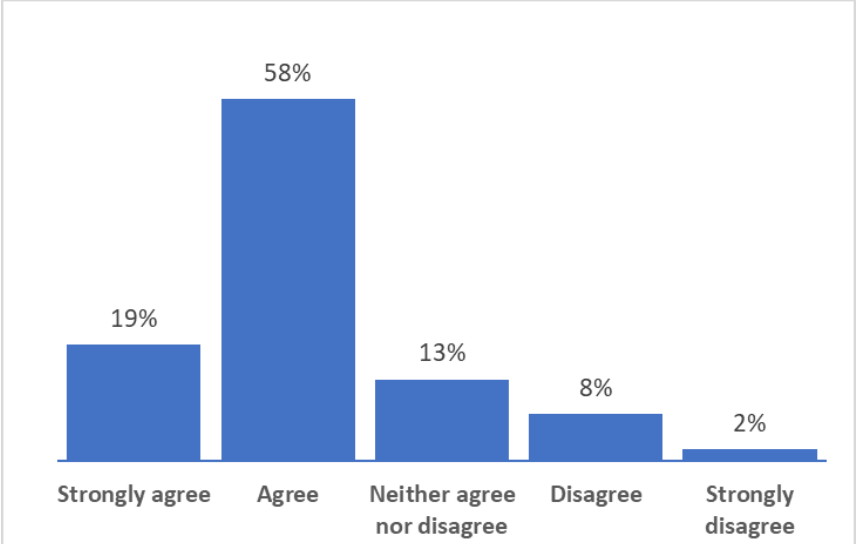
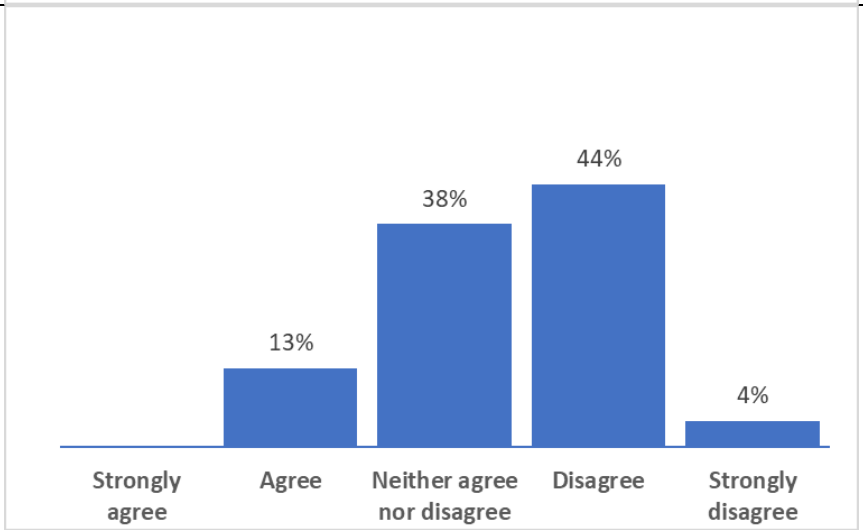
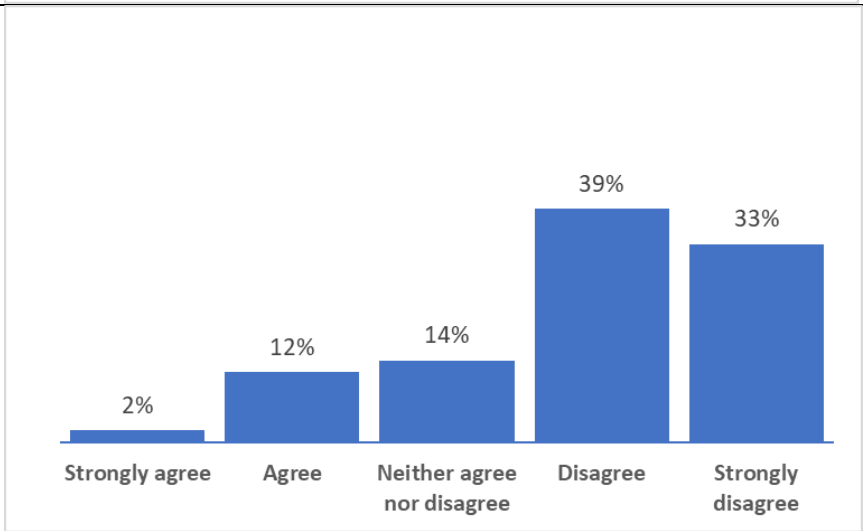
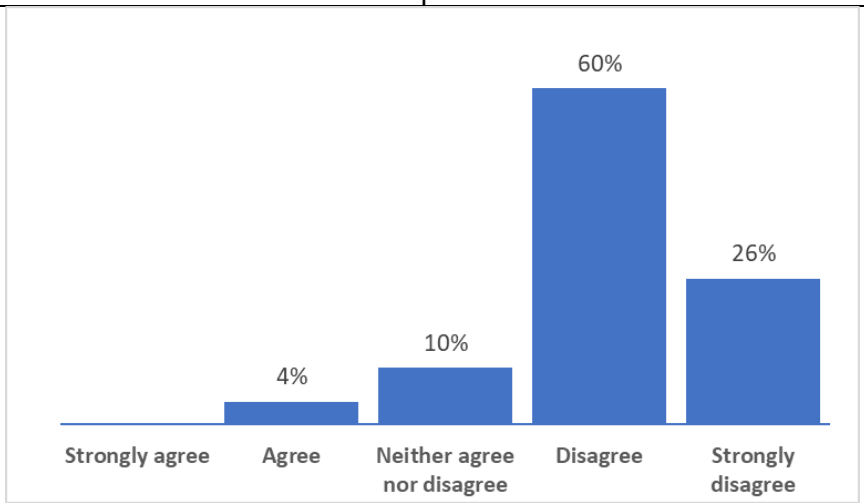
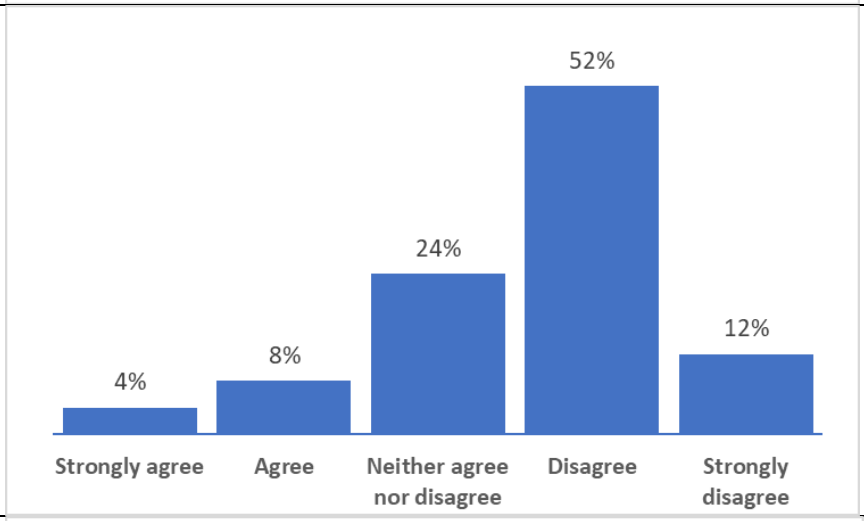
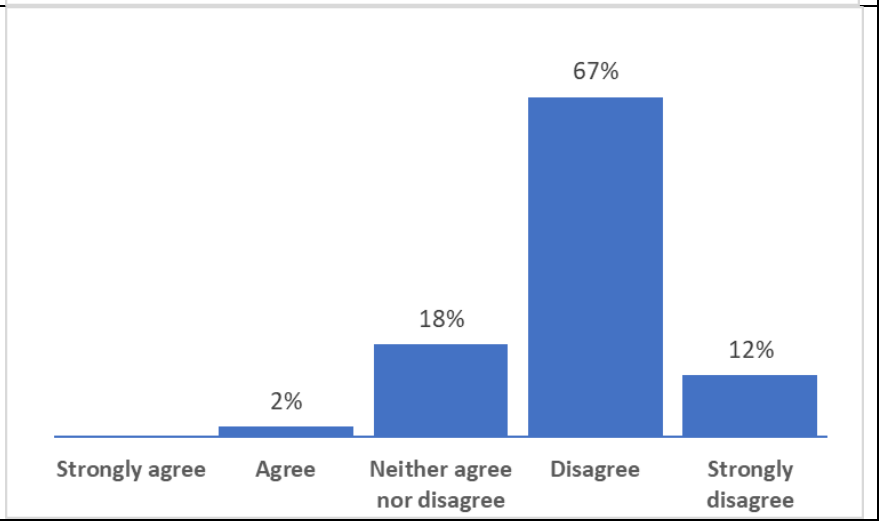
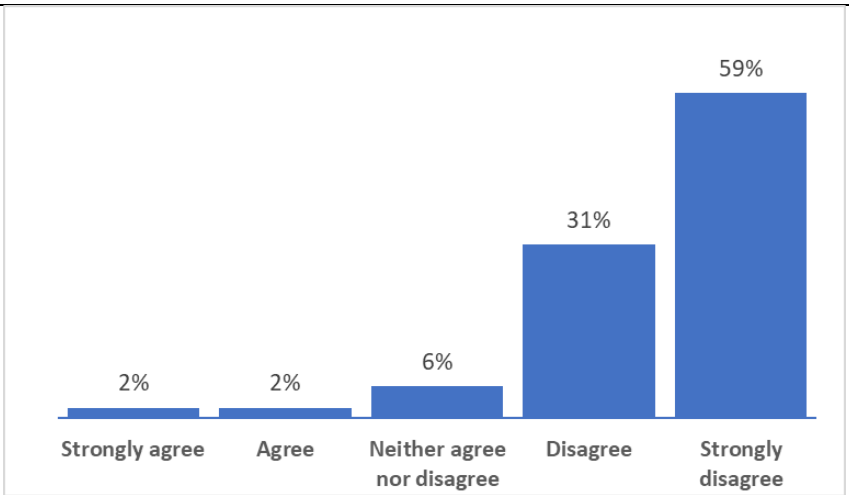
Beliefs	Response
1. There is no point in taking any action in the face of climate change as these actions will not make any difference.	
2. The plan/measured (**Table 4**) identified is generally considered as wise, but the implementation is postponed to the future.	
3. Climate change is not a big challenge, and human inventiveness will be able to cope with it.	

Table 9. Perceived barriers to climate change adaptation

Barrier	Response
1. I am not motivated and have no energy to deal with climate change.	
2. I do not have enough money and resources to adapt to climate change.	
3. I have no ability to deal with the potential dangers of climate change.	

4. There is not enough evidence of climate taking place for us to adapt.	

CONCLUSIONS

The concept of an appraisal of coping from Protection Motivation Theory (PMT) is considered one of the main theoretical frameworks to predict and influence the climate change adaptation behaviour. This report provides the initial results of the survey based on PMT framework. A total of 56 respondents completed the survey representing a wide range of forest owners, managers, consultants and farmers throughout New Zealand. Initial findings showed that only 50% of the respondents have adapted indirectly and directly in the past. To reduce climate change impact in the next 5 years, market diversification, having a response plan, having a flexible harvest plan and deploying resistant tree species are the most common strategies or responses identified by the respondents. Also, the climate related risks vary according to regions, thus require a regional specific action for adaptation to climate change.

The next step is to analyse the data using path analysis to answer two questions 1)“What factors determine whether forest owner or manager are willing to overcome barriers to adaptation actions? And 2), what factors increase or decrease the likelihood of maladaptation?”

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APPENDICES

Appendix 1: Sample survey questionnaire

I. Forest manager/owner's characteristics (*Please mark the circle*):

Gender: O Male O Female

Role: O Forest owner O Forest manager O Forest consultant O Farmer

Age: O Under 18 O 18-24 O 25-34 O 35-44 O 45-54
O 55-64 O 65+ O Prefer not to answer

Education: O Secondary O Certification O Diploma O Bachelor's degree
O Post-graduate diploma/certificate O Master's degree O Doctoral degree
O Prefer not to answer

Region: O Northland O Auckland O Waikato O Bay of Plenty O Gisborne
O Hawke's Bay O Taranaki O Manawatu-Whanganui O Wellington
O Tasman O Nelson O Marlborough O West Coast O Canterbury O Otago O Southland

Land area of forests you own or manage (hectare): _____

Forestry/farming experience (years): _____

II. Risk perception of climate change (*Please mark the circle*)

1. My growing forests will be affected by climate change.
   O Strongly disagree O Disagree O Neither agree nor disagree
   O Agree O Strongly agree

2. Climate change will lead to an increase in forest pests and diseases.
   O Strongly disagree O Disagree O Neither agree nor disagree
   O Agree O Strongly agree

3. Climate change will result in poorer wood quality in New Zealand.
   O Strongly disagree O Disagree O Neither agree nor disagree
   O Agree O Strongly agree

4. Climate change will reduce tree growth /productivity in New Zealand.
   O Strongly disagree O Disagree O Neither agree nor disagree
   O Agree O Strongly agree

5. Climate change will increase the frequency and severity of rural wildfires.
   O Strongly disagree O Disagree O Neither agree nor disagree
   O Agree O Strongly agree

6. Climate change will change my lifestyle.
   O Strongly disagree O Disagree O Neither agree nor disagree
   O Agree O Strongly agree

7. Have you taken any measures to adapt to climate change to your forest?
   O Yes, definitely O Yes, probably O Probably not
   O Definitely not O Do not know

8. How likely is it that a pest or disease outbreak will happen in the next 5 years?
   O Very likely O Likely O Neutral
   O Unlikely O Very

9. How severe do you anticipate a pest or disease outbreak could be?
   O Extremely severe O Moderately severe O Somewhat severe
   O Slightly severe O Not at all severe

10. How vulnerable do you feel about the possibility of a pest or disease outbreak physically affecting your forest?
    O Definitely vulnerable O Probably vulnerable O Possibly vulnerable
    O Probably not vulnerable O Definitely not vulnerable

III. Risks/ threats:

11. As a forest owner/manager/ consultant/ farmer, what worries you the most in the next 5 years? Please rank, 1 as the highest

Risk/threat	Rank
Forest fire outbreak	
Heavy rain, flooding, debris flows and landslides	
Market disruption	
Pest/ disease outbreak	
Windthrow/ wind change	
Others, please specify: _____	

12. Of the highest rank, what do you plan to do to reduce/avoid/manage this risk to your forest? [Please write your answers in the box]

13. How confident are you that your strategy will be help reduce the risk? (*Response efficacy*)
    O Extremely confident O Moderately confident O Somewhat confident
    O Slightly confident O Not at all confident

14. How confident do you feel about your ability to protect yourself and your property from the risk that worries you the most?
    O Extremely confident O Moderately confident O Somewhat confident
    O Slightly confident O Not at all confident

15. How expensive do you think it will be to implement your plans/measures to protect your forest from the risk that worries you most? (*Perceived response cost*)
    O Extremely expensive O Moderately expensive O Somewhat expensive
    O Slightly expensive O Not at all expensive

IV. Inaction/ Avoidance/ Postponement

16. There is no point in taking any action in the face of climate change as these actions will not make any difference.
    O Strongly disagree O Disagree O Neither agree nor disagree
    O Agree O Strongly agree

17. The plan/measure (in Question 12) is generally considered as wise, but implementation is postponed to the future.
O Strongly disagree O Disagree O Neither agree nor disagree
O Agree O Strongly agree

17. Climate change is not a big challenge, and human inventiveness will be able to cope with it.
O Strongly disagree O Disagree O Neither agree nor disagree
O Agree O Strongly agree

V. Adaptation barriers

18. I am not motivated and have no energy to deal with climate change.
O Strongly disagree O Disagree O Neither agree nor disagree
O Agree O Strongly agree

19. I do not have enough money and resources to adapt to climate change.
O Strongly disagree O Disagree O Neither agree nor disagree
O Agree O Strongly agree

20. I have no ability to deal with the potential dangers of climate change.
O Strongly disagree O Disagree O Neither agree nor disagree
O Agree O Strongly agree

21. There is not enough evidence of climate change taking place for us to adapt.
O Strongly disagree O Disagree O Neither agree nor disagree
O Agree O Strongly agree

VI. Social environment

22. Neighbours or friends have implemented risk reduction measures.
O None of them O Few of them O Some of them O Most of them
O All of them

VII. Incentive

23. Climate-related risks information and warnings from official authorities will improve forest owners' capacity to adapt to climate change.
O Strongly disagree O Disagree O Neither agree nor disagree
O Agree O Strongly agree

24. Research on climate resilient tree species or better adapted genetic tree species will improve forest owners' capacity to adapt to climate change.
O Strongly disagree O Disagree O Neither agree nor disagree
O Agree O Strongly agree

VIII. Information sources

25. Where are you most likely to look for/obtain information on climate change? (multiple answers)
O Online news O Television programmes O Social media O Friends
O Radio O Others, please specify, _____

26. Most of the knowledge I have in managing my forest/ plantation comes from (multiple answers):
O NZ Farm Forestry Association O People I know who work in the forests
O Media articles in magazines O TV O My friends and family members
O Others, please specify, _____

Thank you very much.

If you wish to receive a copy of the results, please let me have your contact information:

Name:	
Postal address:	
Phone number:	
Email:	