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3. The report was one of a number of inputs considered by the Ministry in the development of the draft Cannabis Legalisation and Control Bill. The overarching objective of the regulatory framework, which is set out in the draft Cannabis Legalisation and Control Bill, is to reduce the harms associated with cannabis use experienced by individuals, families, whānau, and communities in New Zealand. In developing the model, harm reduction was preferred over other considerations, including economic ones.
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Market structure for recreational cannabis

Poutū-te-rangi 2020

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1 Introduction

With the 2020 New Zealand General Election, there will be a referendum on legalising cannabis for recreational use in New Zealand. This report outlines Business and Economic Research Limited's (BERL) recommended structure for the potential legal recreational cannabis market in line with Government objectives and market decisions agreed by Cabinet. BERL was commissioned by the Ministry of Justice to complete this research.

This report includes a recommendation on how the proposed legalised recreational cannabis market could work in New Zealand. The recommended policy includes the structure of the market, including a cap on the amount of recreational cannabis produced, and how the recreational cannabis market should be allocated and controlled via a quota system. BERL recommends that the legal recreational cannabis market is controlled by the use of a production cap and quota system on the amount of recreational cannabis cultivation, as well as having all participants in the recreational cannabis market licenced at all points in the supply chain (cultivation, processing, and retail).

This report builds on prior BERL research outlining the current and expected future cannabis market, and the associated harms (BERL, 2019). Our prior work involved constructing a baseline model reflecting cannabis users, their consumption, and associated harms and indicators of wellbeing. The harms and wellbeing indicators incorporated in the model were restricted to those that have quantitative data. Qualitative and other impacts of the legalisation of cannabis on the wellbeing of users and their communities have been assessed and summarised in a separate narrative. This includes research findings and information from overseas studies.

Additionally, we constructed a model of business operations across the cannabis value chain to investigate the financial viability of these concerns. This analysis explored how the number of licences at each stage of the value chain (cultivator, processor, and retailer) will affect their likely scale of operations and affect financial viability. We incorporated the impact of excise duties and licence fees (at varying levels) on these operations, as well as restrictions at the retail level on the sale of non-cannabis related products. We also explored the cost to government, and the organisational design options, for a regulatory body to manage and enforce the licencing and other restrictions to be imposed on this market.

We acknowledge that any design of a regulatory regime will go through a number of changes as it transitions from policy development through to legislation. The regulatory framework proposed here was developed at a point in time of the overall policy development process and BERL recognises that interfaces with other regulatory regimes, an overarching public health objective, and a primary focus on harm reduction will all continue to shape the final design.

1.1 BERL process

This work was commissioned by the Ministry of Justice as part of background research on the regulatory framework for the recreational cannabis market. This document builds on the evidence in the first two stages, and presents a regulatory framework for a legal recreational market in New Zealand.

The first two stages of the analysis involved developing a good understanding of the existing cannabis market in New Zealand, modelling how this was likely to change in a legal recreational market, and an extensive literature review on the likely effects of the transition to a legal recreational cannabis market.

The quantitative model was informed by both international and domestic evidence. The analysis included modelling on the initial spike in cannabis use that would be expected following legalisation based on international evidence. A summary of the model is presented in Appendix A.

1.2 Regulatory objectives

The primary policy objectives agreed by Cabinet are:

- Addressing the wellbeing of New Zealanders and harm reduction – the model should minimise harms associated with cannabis, such as health-related harm, social harms and harm to youth
- Lowering the overall use of cannabis over time through education and addiction services, with a focus on lowering the use amongst youths by increasing the age of first use for those disposed to using it. Revenue raised through the regulation of cannabis should contribute to relevant health-related measures.

The agreed secondary policy objectives are:

- Disempowering the gangs and the illegal trade in cannabis
- Lowering the prison population over time and lowering the number of New Zealanders (especially Māori) whose future opportunities are negatively affected by cannabis use charges
- Ensuring product safety and control of THC levels via legislation and regulation
- Consistency with the rule of law – the model should uphold New Zealand’s constitution. It should also minimise opportunities for the illicit market, and be clear and easy to follow
- Tailored and workable for New Zealand – the model should recognise and reflect our cultural practices and the values of New Zealand society, so that it can be accepted by New Zealanders
- Fiscal sustainability – the model should seek to fund mechanisms that directly address cannabis-related harms, while also aiming to lower use over time.

1.3 Key regulatory settings

The key settings agreed by Cabinet were for a model that:

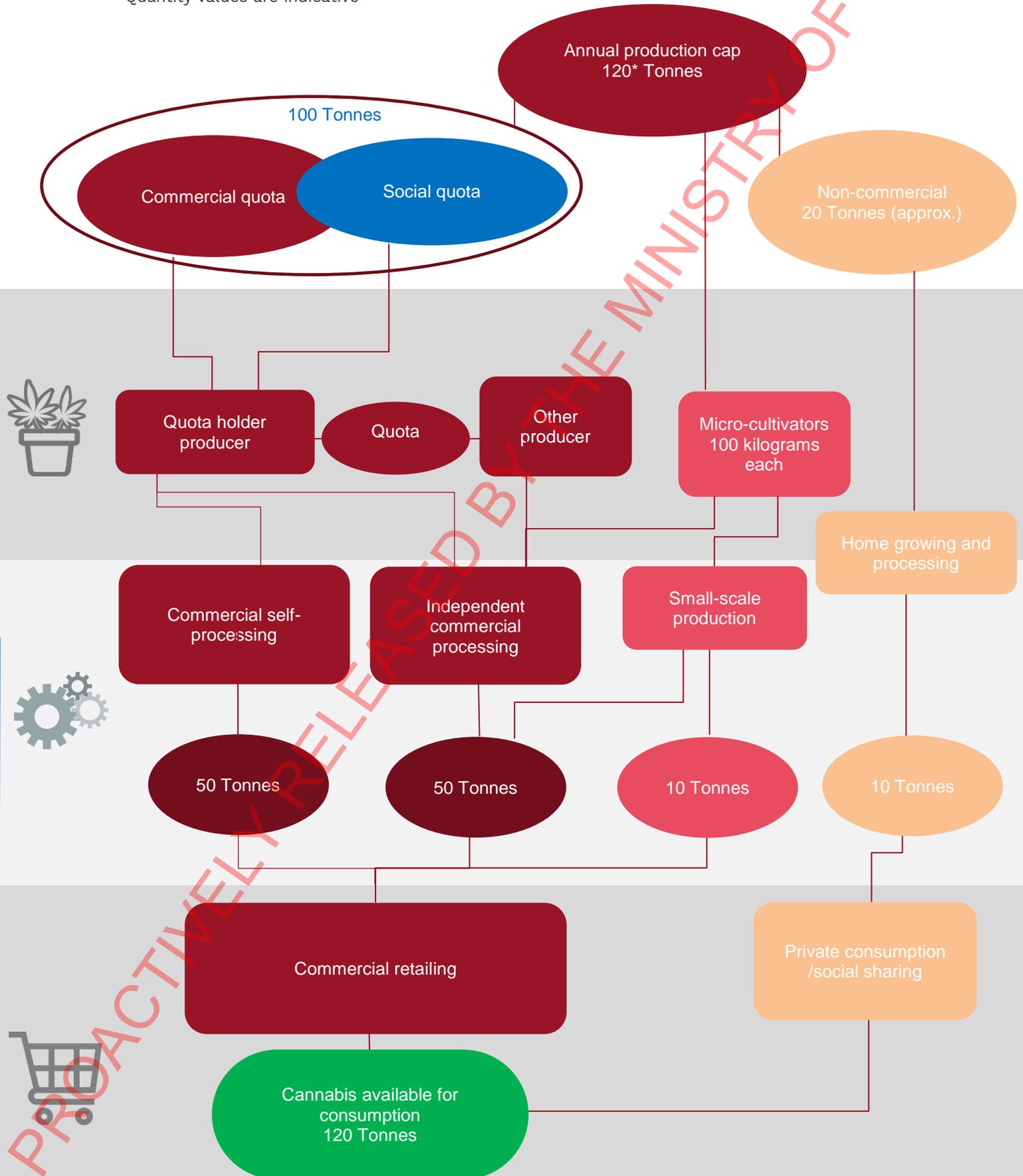
- Establishes a minimum age of 20 to use and purchase cannabis
- Controls and regulates the potency of cannabis and cannabis products available
- Controls and regulates consumption of cannabis to private homes and specifically licenced premises
- Controls and regulates the sale of cannabis through physical stores only (not online or by remote sale)
- Requires the inclusion of health and harm minimisation messaging in the marketing and retailing of cannabis
- Controls and regulates the parameters whereby small amounts of cannabis may be legally shared socially with those over the legal purchase and use age, while reinforcing penalties for individuals who share with those under the designated purchase and use age

- Establishes the regulated market controls over seed and/or plant purchase to permit private cultivation of cannabis at home, including the requirement to keep children and underage individuals safe
- Establishes the regulated market controls that would permit cannabis-infused products to be made at home, but prohibit extraction of resins and other concentrates at home
- Ensures through a state licensing regime that all stages of the supply chain are licenced and controlled
- Controls through a state licensing regime all manufacture of cannabis products, including resins and other concentrates
- Restricts marketing activities, including a ban on all advertising of cannabis products.

On the following page is a visual presentation of BERL's proposed market allocation model, taking into consideration the ability to cap supply of recreational cannabis, not allowing online marketing or sales but allowing home grown recreational cannabis.

2 Proposed market allocation approach for licenced recreational cannabis

*Quantity values are indicative



2.1 Market summary

BERL proposes the design of the licenced market for the supply and sale of recreational cannabis include a quota allocation model; a scalable annual cap on production; micro licensing; and the use of an excise duty and levy. The proposed quota allocation model is a market based instrument for the government to allocate a controlled amount of recreational cannabis each year. A production cap allows for a commercial quota, as well as special allowances to support a micro-cultivator system and home-growing. An outline of how the proposed quota will work is proposed in section three.

The licenced market will be regulated via a licencing system for controlled activities at all stages of the supply chain. This is outlined in section seven.

2.2 New Zealand approaches to market allocation

Market allocation systems are used where there is a finite resource that needs to be allocated to entities that use the resources. New Zealand employs a number of market allocation methods, including the quota management system for the New Zealand fisheries, and the radio spectrum allocation. If the legal recreational cannabis market in New Zealand is to be capped, practical application of the allocation can be applied to the allocation of the cannabis market.

2.2.1 New Zealand Fisheries

The Ministry of Primary Industries (MPI) administers the quota for fisheries in New Zealand. Each year, MPI sets the total quota for each species of fish or plant, to ensure that the total catch maintains the fisheries at a sustainable level. Quota is allocated as a share of the total allowable catch quantity each year (MPI 2019).

Originally, the quota was a fixed quantity rather than a percentage share. This was a challenge for administering the quota when the orange roughy population started to collapse. To prevent overfishing, significant buybacks of orange roughy quota were required. Subsequently, fishing quota has been converted to percentage allocations (Straker, Ker, Hendy, 2002). With a percentage allocation, the total quota limit is much more flexible as quota can be adjusted annually, though this adds additional uncertainty to the quota holders.

To allow the catch to be consistent each year, but within the total allowable catch, quota may be leased on an annual basis as an Annual Catch Entitlement (ACE). ACE is traded freely on a secondary market, and allows businesses to participate in the market without holding quota. The ability to sell ACE allows the market to function.

Māori entities are guaranteed 20 percent of the total quota under management. Of the initial allocation of quota for fisheries, half of the total quota was allocated to Māori entities.

Recreational fishing receives an allocation within the total allowable catch each year. This allows individuals to catch their own fish, though this cannot be sold. This is similar to the proposed restrictions on legal home-grown recreational cannabis in New Zealand, with only personal use and social sharing being allowed.

2.2.2 Radio spectrum

The radio spectrum is also a resource that has a finite amount of space that needs to be allocated for a wide range of purposes. The allocation of the radio allocated by the Ministry of Business Innovation and Employment (MBIE) for frequencies lower than 3,000 gigahertz.

Management rights of a section of the radio spectrum are similar to a property right, and can be bought and sold. These rights typically have a duration of 20 years. After purchasing a management right over a block of the spectrum, the holder of the management right is able to sell spectrum licences for specific frequencies within this block.

2.2.3 Radio spectrum auction

For the allocation of the radio spectrum, blocks of spectrum were auctioned using a simultaneous auction. This type of auction means that purchasers wishing to purchase specific combinations of blocks are able to identify their success on the whole combination. As cannabis blocks would all be identical, the combination of blocks will not be relevant, allowing for a more traditional auction where blocks are auctioned individually.

There are some key differences in the fisheries quota management system and radio spectrum auction process that may mean a similar process is difficult to apply to the cannabis market. Firstly, obtaining a licence to participate in these industries does not have strict licence requirements.

3 Production quota allocation model

The in-principle recommendation of BERL is to manage the recreational cannabis market through a quota allocation model. This model allows the market to operate freely within predetermined bounds, preventing some of the international challenges arising from unrestrained markets. Quota systems are also flexible and are able to be adjusted as the market develops. Quota should be allocated as a percentage share of the overall cap, allowing flexibility for the regulator to adjust the quota as required.

Quota systems place a limit on the total quantity produced, with production allocations being held by every cultivator in the market. Quotas are used around the world in markets with a fixed supply of products that can be sold. For example, the New Zealand fisheries quotas. These allocations are a type of property right, and can be bought, sold, and leased on an annual basis. The radio spectrum management in New Zealand has similar characteristics to a quota, with a limited amount of space that is allocated by auction. A summary of our analysis is available in Appendix F.

3.1 How the proposed quota allocation would work

We propose a production cap is imposed on the quantity of recreational cannabis cultivated for recreational purposes in New Zealand. The production cap will set a limit of the total recreational cannabis quantity that may be produced each year, and be enforced at the point of cultivation. The quota will be allocated a percentage entitlement to that capped production amount. It will be allocated in blocks, representing a percentage of the total quota each year. After the quota is set for a year, cultivators will be able to cultivate recreational cannabis up to their share of the total market.

Access to purchase a quota under the production cap will be limited to participants with the necessary valid licence. The licences are discussed in more detail in section seven.

An entity's quota sets the percentage of the recreational cannabis production cap they are entitled to sell annually (for example, 1 percent = 1 tonne, if the production cap is set at 100 tonnes). The system is based on weight of dried cannabis. To ensure the market is functional with adequate investment in production, the regulator may place an upper or lower bound on potential quota changes. This allows some flexibility in moving the market, while also providing some certainty to cultivators, processors, and retailers.

For example, if the quota was set at 100 tonnes, with 100 quota blocks available, each cultivator would be able to cultivate 1 tonne per block. If the following year the quota was reduced to 90 tonnes, quota holders would be able to cultivate 0.9 tonnes per block. After the initial allocation of the quota, the quota would be tradable to other licenced cultivators within the same quota allocation tier on a permanent basis.

BERL recommends no single entity should be allowed to own more than 20 percent of the quota allocation.

3.1.1 Tiered quota

Quota blocks are similar to shares in a financial market. In the interest of promoting social equity and harm reduction, we propose that the quota could be allocated with two tiers. The first tier would be allocated specifically to cultivators that meet certain social equity objectives. The regulator, in alignment with the social equity objective, can set the extent of quota allocated to

each tier. The residual from tier one may then be allocated to tier two and open to all licence holders.

For this model to meet the social equity objectives, the first tier of quota will require limited tradability, with trading only being permitted between other parties that meet the specific tier-one criteria. A similar system is applied in the fishing industry with 50 percent of quota for managed fish stocks being allocated to Māori fisheries, and 20 percent for any additional managed fish stocks.

3.2 Financial auction allocation

The initial allocation of the quota will have high levels of uncertainty for cultivators in the recreational cannabis market. In the event that cultivators intending to enter the market have planned production levels larger than the quota level, BERL proposes an auction for allocating the quota. Compared with some other allocation models, this system is relatively easy to apply, as after the auction, quota can be bought and sold between qualified parties.

Under this allocation system, all pre-approved firms and individuals bid on set blocks of quota. The quota will set the maximum production quantity of each of these firms. Firms that intend to cultivate recreational cannabis but do not purchase a quota, will be limited to a micro-cultivation limit of 100 kilograms. They may also purchase quota from a similar tier firm holding a quota. The monetary amounts bid for production quota would be in addition to licence fees and other application fees.

The financial auction should be conducted in two rounds for each tier of the allocated quota. The first tier should be allocated first to the growers that meet the social equity objectives, while the second tier will then be auctioned in an auction available to all licenced cultivators.

3.2.1 Alternative initial allocation models

In addition to the recommended model, the following alternative model to the auction allocation system was considered. The allocation could be a more principled based allocation method. This could include a points-based system, where firms most aligned with Government objectives are allocated quota.

This model has a number of challenges, the first being allocation of the correct amount per firm to achieve the desired production levels. There are also challenges for this process on an ongoing basis. With changing ownership, staff, and business practices, firms will evolve over time, and other firms may emerge that would be more able to meet the Government objectives.

As obtaining quota under this system does not require financial outlay, there is a risk that producers will obtain more quota than they are able to use. This would require ongoing production measuring, and a “use it or lose it” policy to ensure production is near the quota level.

To maintain the social benefit of having a principles based approach for allocating quota, the regulator will need to build in an ongoing process for managing the quota. This could include having a short duration of one to three years, after which providers need to be evaluated against other potential entrants. Short quota duration may significantly limit capital investment in recreational cannabis production, as the investment will need to be recovered during the life of the quota.

There is another option of continuing with a financial transaction approach, though each transaction will need to be pre-approved to ensure that the purchasing firm will meet the same

objectives as the party that received the initial quota. There will also be ongoing regulation costs to ensure companies operate in line with their stated intentions and production levels.

3.3 Quota tradability and reallocation

We recommend that quota be allocated on an ongoing basis via market tradability. This will require little ongoing resource from the regulator, and provides a financial incentive for quota to be fully utilised. As there will be two classes of quota issued initially, purchasing quota will require the purchaser to meet the same standard as the initial purchaser. For example, if an entity receives an allocation of the social quota, and cannot fulfil their quota, they may trade it only to another entity that also meets the same social criteria.

As well as maintaining the quota tradability, the regulator may also limit the duration of the quota. This will add flexibility in controlling the size and structure of the recreational cannabis market if market-failures emerge, and will provide certainty of the quantity that may be produced to the investors in the industry.

3.3.1 Quota duration

As quota will be similar to a property right, issuing the quota on a permanent basis (as in the fishing quota), may result in the market being held by few participants, with little change in participants from the initial allocation. To support the social equity objectives and to make the market more dynamic, the regulator may limit the duration of the quota.

Allocating a quota with a relatively short duration would be expected to restrict initial investment in becoming recreational cannabis cultivator. Based on BERL modelling, it is recommended that the quota has a minimum duration of five years, as this will allow time for initial investments to be recovered (BERL, 2019).

3.3.2 Adjusting quota

BERL proposes that the production cap be set each year by the regulator. Individual quota holders will keep their specific percentage allocation, and it will vary in tonnes depending on the maximum quota set by the regulator each year. Fixed quantity limits are also possible, though this requires the regulator to sell and buy quota from the market to adjust the quantity level. As this was the original model for the fishing industry, and subsequently removed due to the high costs of application, a percentage share of the total quota is recommended for legal recreational cannabis cultivation.

3.3.3 Regulator

The regulator will be responsible for the administration of the quota, through the licencing regime. The regulator will work on a cost recovery basis through the licencing fees.

3.4 Relationship to licences

Participation in the quota system would require any quota holder, or any party purchasing an annual cultivation allocation, to have a licence to produce recreational cannabis. With a quota system, the number of licences for producers will not be limited, though all licenced cultivators will not be able to cultivate above the overall quota limit.

3.5 Managing the market not included in the quota system

The proposed market will have two components outside the quota system: a private home-grown market, and a micro-cultivation market for very small-scale cultivators. This is similar to the model for recreational fishing, where commercial fishers operate within a quota system, and the public is able to fish freely without quota but within daily limits.

3.5.1 Micro-cultivation business

As with the commercial fisheries, we recommend an allocation outside of the quota system. We recommend a micro-cultivation licence for cultivating and processing a maximum of 100 kilograms of dried cannabis. These cultivators will be outside the quota system, though the products will have to meet the same quality standards as in the quota system. This is considered in more detail under the cultivation model in section four.

3.6 Proposed quota limit

As any legal recreational cannabis market will be in competition with an existing illegal market, a legal recreational cannabis market with a limit lower than the level of use in the illegal market will result in the illegal market continuing to operate. This will perpetuate the harms arising from the illegal market, including unregulated products with limited or no testing.

3.6.1 Recommended limit to recreational cannabis

The recommended cap on recreational cannabis production is **110-120 tonnes per annum**. This is based on projections for the recreational cannabis market in the first years post-regulation, and adjusted for home-grown cannabis and imperfections in the supply chain.

3.6.2 Current use

While cannabis is currently illegal, it remains widely available in New Zealand. BERL modelling suggests 74 tonnes of cannabis is consumed each year in New Zealand. A breakdown of cannabis use across population groups is presented in Table 3.1 (BERL 2019).

Cannabis use rates are particularly high for individuals under 30 years old, and a significant majority of users are male. The communities most affected by cannabis use have higher deprivation index scores, with the costs of cannabis amplifying other challenges arising from deprivation.

Māori are also highly affected by cannabis use. Almost a quarter of the cannabis users in New Zealand are Māori, while Māori make up approximately 16 percent of the New Zealand population.

Table 3.1 Cannabis use in New Zealand

		Users	Share of population	Total annual consumption	Total value of consumption
		number	%	Kg	\$pa
Use	Daily	113,033	3	62,963	1,259,266
	Frequent	122,360	3	9,426	188,520
	Periodic	194,004	5	1,569	31,380
	Rarely	127,846	3	125	2,497
	Total	557,244	14	74,083	1,481,663
Deprivation 1=least deprived					
	One	57,359	8	4,374	87,477
	Two	72,378	10	7,463	149,264
	Three	123,823	15	16,815	336,294
	Four	136,715	16	15,473	309,453
	Five	166,969	22	29,959	599,173
	Total	557,244	14	74,083	1,481,663
Age	15 to 20	98,412	31	9,158	183,160
	20 to 25	118,580	33	16,072	321,444
	25 to 30	99,426	26	16,146	322,917
	30 to 35	51,622	16	6,302	126,041
	35 to 45	70,721	12	9,817	196,350
	45 to 55	59,151	9	7,790	155,792
	55 to 65	29,450	5	4,014	80,290
	65 +	29,880	4	4,783	95,670
	Total	557,244	14	74,083	1,481,663
Sex	Male	341,622	18	49,076	981,524
	Female	215,622	11	25,007	500,139
	Total	557,244	14	74,083	1,481,663
Ethnicity	European	369,284	14	45,884	917,682
	Māori	123,870	25	18,309	366,184
	Other	64,089	8	9,890	197,797
	Total	557,244	14	74,083	1,481,663

Source: BERL 2019

3.6.3 Expected use

In every market where recreational cannabis has been legalised, rates of recreational cannabis use increase substantially in the years immediately after legalisation. The rate of increase varies significantly between jurisdictions, and will be dependent on a wide range of factors, including local regulations and social perceptions of cannabis.

In the USA, rates of recreational cannabis use for users over 18 years old increased post-legalisation. The largest growth was in individuals aged over 26 years old, who on average had the lowest rates of use prior to legalisation. Colorado and Washington were the first states to legalise recreational cannabis in 2012 (SAMHSA, 2008-2018). In Colorado, the average recreational cannabis use in 2009 and 2010 was 12 percent of the adult population over 18 years of age. By 2015, the annual use rate had risen to 20 percent. Similarly in Washington, recreational cannabis use increased from 11 percent in 2010 to 15 percent in 2015.

However, Washington and Colorado both had eight percent decreases in the rate of annual use for individuals aged 12 to 17 years old. For 18 to 25 year olds, use rates were up marginally in Colorado, from 43 percent in 2010 to 45 percent in 2015, while Washington saw a decrease from 41 percent to 35 percent.

Other states of the USA have similar trends, though there are fewer years of post-regulation to analyse any trends. On this basis, the change in New Zealand would be expected to increase in the years post legalisation to 103.5 tonnes per year. A breakdown of this use is presented in Table 3.2.

3.6.4 Accounting for imperfections in supply chain

As the proposed quota is at the cultivator level of the supply chain, it is unlikely that all cannabis from the initial production will be formed into retail cannabis products. This includes quota holders not meeting their quota limit exactly, and not all produced cannabis being sold each year in retail stores. We estimate that having the limit set at approximately 10 percent above expectations would be sufficient, though this can be adjusted after the market is established as required.

3.6.5 Underage and illegal consumption

The quantity to be set as the quota limit will have a range of different effects and may have different impacts on the Government objectives. The projected cannabis consumption of 103 tonnes includes 8.6 tonnes consumed by individuals that will be underage for legal consumption. This demand will be met either through legally cultivated recreational cannabis being supplied to underage users, or through cannabis cultivated illegally.

There will also be some portion of the adult consumption being supplied from illegal cannabis cultivators. In estimating the quantity consumed by the illegal market, this will be dependent on a wide range of factors, including the extent to which market demand is met by the commercial legal market.

3.6.6 Recommended quantity limit

The regulator should build flexibility into the quota management system, with the ability to adjust periodically as required. Taking into account recreational cannabis market demand, imperfections in the supply chain, and home-grown production, the New Zealand recreational cannabis market would require a quota allocation of approximately 100 tonnes. Setting the initial quota at lower than this level, would perpetuate a share of the illegal market and the challenges arising through unregulated cannabis products and THC levels, as well as possible associated health harms.

Table 3.2 Projected use in legal market

		Users	Share of population	Total use	Legal use	Illegal use	Total value of consumption
		number	%	Kg	Kg	Kg	\$
Use	Daily	151,706	4	87,877	69,443	18,434	1,623,726
	Frequent	166,832	4	13,407	10,974	2,433	246,697
	Periodic	243,236	6	2,052	1,476	576	38,282
	Rarely	166,076	4	174	131	43	3,230
	Total	727,851	18	103,510	82,025	21,485	1,911,968
Deprivation 1=least deprived	One	74,568	10	6,152	4,926	1,226	113,500
	Two	94,916	13	10,514	8,489	2,026	193,789
	Three	162,537	20	23,682	19,066	4,616	436,630
	Four	177,763	20	21,536	16,956	4,580	398,095
	Five	218,068	29	41,626	32,589	9,037	769,941
	Total	727,851	18	103,510	82,025	21,485	1,911,968
Age	15 to 20	90,289	29	8,596	0	8,596	171,920
	20 to 25	135,307	38	19,086	16,498	2,588	348,730
	25 to 30	146,720	39	25,033	21,626	3,407	457,411
	30 to 35	76,177	23	9,794	8,467	1,328	178,952
	35 to 45	104,389	18	15,240	13,170	2,070	278,464
	45 to 55	87,353	14	12,105	10,464	1,641	221,174
	55 to 65	43,449	7	6,232	5,385	846	113,864
	65 +	44,168	6	7,423	6,414	1,009	135,633
Total	727,851	18	103,510	82,025	21,485	1,911,968	
Sex	Male	449,075	24	69,325	56,443	12,882	1,276,419
	Female	278,776	14	34,185	25,582	8,603	635,449
	Total	727,851	18	103,510	82,025	21,485	1,911,968
Ethnicity	European	484,980	18	65,095	53,089	12,006	1,198,319
	Māori	158,608	32	24,402	17,478	6,924	455,532
	Other	84,264	11	14,013	11,457	2,555	257,870
	Total	727,851	18	103,510	82,025	21,485	1,911,968

Source: BERL 2019

3.7 Market allocation in other legal markets

Legal recreational cannabis is a comparatively recent development, with Uruguay and Canada being the only two countries with a national legal recreational cannabis market. In the USA, recreational cannabis is illegal nationally, but is increasingly becoming legal in individual states.

The policy approaches to regulating the recreational cannabis market differs between each state in the USA, each province in Canada, and in Uruguay. This variation gives some valuable insight for New Zealand as to what may occur in a legal market.

Internationally, no other market has trialled a capped legal recreational cannabis production model using a quota management system. The closest example is Uruguay where, as of January 2019,

only two producers were permitted to make legal recreational cannabis, which can then only be sold at pharmacies. Uruguay has the most controlled legal retail market, requiring individuals to register with a pharmacy, and they are then limited to 40 grams per month. This has resulted in only 35,000 people registering to buy cannabis from these pharmacies. (Jordan, 2018)

3.8 Alternative models

3.8.1 Limited licences

In addition to our proposed model, an alternative mechanism to limit the total quantity produced is to apply production limits to licences, with a limited number of licences. For a desired 100 tonne production, this could be issued based on a number of licences with a fixed quantity for the intended production.

With a maximum production limit enforced by licencing, many producers will produce substantially below the licenced production level. This makes control over the quantity produced very difficult, as the difference between intention and production places significant variability in the market. In Colorado, licencing fees vary based on the number of plants, yet the majority of cultivators utilise less than half of their allocated production (Light et al 2018).

This model also places a large regulatory burden on the regulator to allocate these licences on an ongoing basis. If a producer exits the recreational cannabis market, or expects a lower than allocated output, the regulator will need to re-allocate the quantity to a new or existing licence holder. Having a dynamic quantity allocation of licences under review each year is also likely to result in high levels of uncertainty for producers in the market, which may limit their market participation.

3.8.2 Unrestricted market

An alternative to a quota system or limited production is a market with no quantity restriction. This would place recreational cannabis in a similar position to tobacco and alcohol, where the primary lever to reduce or limit use is increasing the cost through excise duties. This has a number of challenges for regular users, as increases in excise duties can result in an increased portion of income spent on these products rather than a reduction in use. A greater financial burden is then placed on these individuals, generating financial distress without meeting the intended objective.

4 Proposed cultivation model

Cultivating recreational cannabis is the start of the supply chain, and includes cultivating cannabis, from seeds or clones. The cultivation process ends when cannabis buds are harvested from the cannabis plants. After harvesting, the cannabis is sent to processors to be dried and formed into cannabis products for retailing.

4.1 Recommended model – quantity controlled

BERL recommends that the recreational cannabis market is restricted through a quantity cap at the cultivator level. This would limit all recreational cannabis produced to a maximum of **120 tonnes** of dried cannabis or equivalent product. As cannabis is dried to be turned into a consumable product, the production cap expressed as wet recreational cannabis (prior to being dried) would be approximately 600 tonnes.

4.2 Quota system and licencing

The recommended model for cannabis cultivating in New Zealand is a quantity capped and licenced model. The proposed licence system is highlighted in section seven, and the quota system was described in section three.

4.3 Expected shape of market

With cultivation capped by a quota system, the shape of the cultivation market will depend on the allocation process and the outcome of allocation. At minimum, the 20 percent limit on production quota requires a minimum of five different recreational cannabis cultivators. There will also be home growing and micro-cultivation markets that will be in competition with the commercial production market.

4.3.1 Micro-cultivators

Under the allocation approach, the total micro-cultivator industry would be expected to cultivate and supply a maximum total of 10 tonnes per year. If each cultivator produces the maximum 100 kilograms each, BERL modelling suggests that the full micro-cultivator market will be made up of a maximum of 100 micro-cultivators.

A micro-cultivator operation could generate revenue of up to \$324,000 per year. Operating costs and profit for micro-cultivators are presented in Table 4.1. This would suit small firms of up to two full-time staff, or a small group of part-time workers.

Table 4.1 Micro-cultivator typical financial summary

Micro-cultivator financial summary	Per gram values	
Volume of dried cannabis (grams)	100,000	
Revenue (\$)	324,000	3.2
Operating costs - labour (\$)	110,000	1.1
Operating costs - other (\$)	183,000	1.8
Total costs (\$)	293,000	2.9
Profit (\$)	31,000	0.3

Source: BERL

4.3.2 Home-grown cannabis

Making provision for home-grown cannabis is recommended. It is unlikely that recreational cannabis retail stores will be able to provide regulated cannabis product to all rural areas of New Zealand. Allowing individuals to cultivate their own cannabis may reduce the prevalence of illegal cannabis in rural communities.

Home-grown cannabis is permitted in jurisdictions with legal recreational cannabis. The quantities of cannabis permitted to be cultivated for personal varies significantly between areas based on local regulations and climate. The extent of home-grown cannabis in a legal market will depend on the price, quantity, and availability of legal recreational cannabis, but is expected to be approximately 10 percent of the market. In the USA, the National Survey on Drug Use and Health estimates that approximately 3.9 percent is cultivated at home, though this is illegal in most states. A RAND Corporation survey found that 17 percent of medicinal cannabis users in Washington used home-grown cannabis (Light et al, 2018).

4.4 Supply chain integration

Internationally, legal recreational cannabis is a new industry, and a range of restrictions have been placed to support competitiveness, including restrictions on supply chain integration. Integration of the supply chain can occur horizontally, by accumulating market share within one section of the supply chain, or vertically by accumulating market share down the supply chain (cultivators, processors, and retailers).

New Zealand has competition law in the form of the Commerce Act 1986, which is enforced by the Commerce Commission. While many of the anti-competitive outcomes of market structure are illegal under the Commerce Act, explicitly restricting certain market structures for the recreational cannabis industry may be beneficial in meeting the Government objectives.

For cannabis cultivation, unrestricted horizontal integration would allow one cultivator to produce all of the legal recreational cannabis in New Zealand (though pursuing a full market share would be illegal under the Commerce Act). Large horizontal market share allows one section of the supply chain to have a high level of bargaining power, which can be used to control the other sections of the market.

BERL recommends that no single cultivator should hold more than 20 percent of the total quota at the cultivation level. If the market is capped at the cultivation stage of the supply chain, the maximum allowable share of quota for each entity will limit the extent of horizontal integration.

This would enforce a minimum of five recreational cannabis cultivators, though it is expected that more than five cultivators would enter the market.

In Washington (USA) and British Columbia (Canada) (British Columbia, 2020), cultivators are not able to engage with all three major sections of the supply chain, requiring retailers to be owned independently of the cultivators. In the USA, some states including Arizona, where only medicinal cannabis is legal, vertical integration is required for the strict product control that can be achieved between cultivation and sale (Pena 2019).

Previous BERL advice to the Ministry of Justice, included a recommendation to limit the ability to vertically integrate in the recreational cannabis markets. With a proposed quota management system, restriction of vertical integration might not be needed. With this system no one company can achieve a dominant position in any one part of the supply chain, and use that position to extract market share or profitability from other parts of the supply chain by vertically integrating.

Vertical integration could also be expected to support the development of small businesses, as cannabis can be grown, processed and sold by a single company. This could allow business to operate within their community in rural areas if larger companies were unwilling to open a retail store.

4.4.1 Horizontal integration restriction will achieve Government objectives

The primary risk of unrestricted integration is entities gaining very large market power, and controlling the market in a way that does not meet the Government objectives. With the proposed horizontal integration restriction in the cultivation level, cultivators have an allocated market share in accordance with their quota. As cultivators are limited in market share, but have exclusive rights to cultivate recreational cannabis up to their quota, having a dominant market share in the retail or manufacturing stage of the supply chain will not be possible.

To support a functioning market, an unrestricted vertical integration model is recommended, as the major risk (of single players dominating the market) will be controlled by horizontal integration restriction, and the Commerce Act. These include allowing smaller-scale growers to cultivate, process and retail cannabis in their own area, while also allowing for a more competitive market, and more efficiency in the supply chain.

4.5 Alternative models

The quota system for regulating the quantity of recreational cannabis will be a unique model, with no other jurisdictions employing a quota system or production limit. Other jurisdictions do apply some types of restriction, either through licences, taxes, and/or regulations.

Unrestricted cultivation may be more effective in removing the illegal market, but there is a possibility of significant oversupply, or recreational cannabis being cultivated legally and sold illegally. Another option is limiting the area in which to cultivate recreational cannabis. While this can place a ceiling on the amount produced, it can be very hard to regulate as producers will have different yields.

4.6 Cultivating recreational cannabis in other legal markets

Recreational cannabis cultivation models around the world are similar with no restriction on the quantity of cannabis that can be cultivated. As licencing often has a limited production area, or a variable amount of fees for an allocated cultivation area, the amount that can be cultivated is

dependent on the amount of licences issued. Some jurisdictions have stopped issuing licences where oversupply has occurred.

4.6.1 Uruguay

As of the start of 2019, there were only two Licenced Producers (LP) of recreational cannabis in Uruguay. LP need to cultivate under the following conditions as reported by Pascual (2018):

- Applicants have to pay US\$5,000 to participate in the tender process. This figure does not include the actual licence fee
- Each producer will be assigned a field of roughly three hectares, located next to the existing LP on government-owned land
- LP will be responsible for internal security, but external security of the field will be provided by the government
- Cannabis must be cultivated indoors or in a greenhouse, with the capability of controlling temperature, light and humidity
- Only the strains provided by the government can be cultivated – only two strains are being cultivated commercially in Uruguay, and both varieties are capped at nine percent THC. The government will also provide tracking software
- LP must have at least one agronomist, and a quality-control expert with experience in good production practices
- Applications must include estimated investment and other financial information, including the origin of funds. (Pascual 2018)

4.6.2 United States of America

In Washington, there is currently an oversupply of cannabis and prices of retail cannabis are plummeting. This has resulted in the Washington State Liquor and Cannabis Board no longer providing any additional recreational cannabis cultivation licences. It has also placed a ceiling on the amount of cannabis that can be cultivated. Improved efficiency per square metre may result in the supply increasing again.

In Oregon, there is also an oversupply of recreational cannabis, with Oregon State Attorney Milly Williams stating the market is “out of control”. (United States Attorney’s Office, 2018) The state has placed a restriction on new cultivators for at least two years.

4.6.3 Canada

In Canada, recreational cannabis cultivation is regulated nationally by Health Canada. At the cultivator level, there is no limit to the amount of recreational cannabis that can be cultivated with a cultivator licence, and there is no limit to the number of licences. Currently, the market in Canada has been unable to meet the demand for legal recreational cannabis, with shortages across the country (Thomson, 2018). There are a variety of hypothesised reasons for this shortage, including stockpiling in preparation for the legalisation of cannabis edibles.

5 Proposed processing supply chain model

The processing component of the supply chain is the portion of the industry that takes the wet cannabis bud/flowers and plant material from cannabis cultivators, and turns it into processed cannabis products (dried cannabis, edibles, oil and resin) ready for consumption by consumers. Because of the array of final cannabis products that processors can manufacture, the processing supply chain sector is the most complex part of the recreational legal cannabis industry.

5.1 Recommended model – unrestricted

The recommended model for firms and individuals to acquire one of two processing modules for their recreational cannabis licence is an **unrestricted model**. Under this model, any firm or individual who holds a recreational cannabis licence may apply for, and receive, a standard processing module for their licence without any restrictions applied to them, apart from set processing and testing standards. In addition, any firm who holds a cannabis micro-cultivation module can process their own cultivated supply of cannabis into cannabis products ready for the retail market.

An individual or firm with a standard processing module on their recreational cannabis licence can obtain cannabis bud/flowers and cannabis plant material from a licenced cultivator. In addition, they can sell or distribute their cannabis products to a licenced retailer. As stated, an individual or firm with a micro-cultivation licence will only be able to process cannabis that they have cultivated and will not be able to obtain any further cannabis from other cultivators. They must also distribute their cannabis products to a licenced retailer.

Processing and testing standards will be built into both licence modules. Testing standards will dictate what product testing must be undertaken and when in the processing supply chain it must be undertaken. Furthermore, these testing standards will dictate the maximum THC levels a cannabis product can have. Processing standards will prescribe how cannabis products can be processed, including how they are packaged, and what information is to be displayed on the product. The exact processing and testing standards will be set by the new regulatory authority.

5.2 Expected shape of market

Under the recommended model, BERL would expect that the shape of the market would be:

- 50 tonnes of dried cannabis or equivalents would be processed annually by three large firms. It is expected that these firms would also have cultivator licences
- 50 to 60 tonnes of dried cannabis or equivalents would be processed annually by around 20 smaller processors. It is expected that these smaller processor firms would be a mix of firms, some of which would also have a cultivator licence, and some would not
- Up to 10 tonnes of dried cannabis or equivalents would be processed annually by micro-cultivators, who can process their own cultivated cannabis under a micro-cultivator licence. Micro-cultivator who do not process their own cannabis will sell it to commercial processors (BERL, 2019).

The expected shape of the market is based on BERL's economic knowledge that firms, if able, will vertically integrate in order to maximise their profit and secure their supply chains.

5.3 Processing model in other legal markets

This section provides details on the processing models using in other legal markets, including Uruguay, Canada and some states within the USA.

5.3.1 Uruguay

In February 2019, a call for applications was announced with the Government looking to add up to five more LPs of recreational cannabis. New licenced producers need to produce the cultivated cannabis under the same conditions as the two existing producers:

- Approved production quota of 2,000 kilograms (4,400 pounds) per year of dried flower. No other products will be allowed to be produced
- UNIT ISO 9001/2015 certification (a quality standard) by an external certified agent is mandatory
- LPs must have at least one pharmaceutical chemist, and a quality-control expert with experience in good practices
- Applications must include estimated investment and other financial information, including the origin of funds. (Pascual, 2019)

5.3.2 Canada

In Canada, the processing segment is split into two licence categories: standard processing and micro-processing. For a standard processing licence, there is no limit to the amount of recreational cannabis a processor may process each year. Micro-processing licences can only be applied for if the applicant already has a micro-cultivator licence. In addition, micro-processors are limited to processing 600 kilograms of dried cannabis (or equivalent) in one calendar year.

In Canada it is generally acceptable for firms to apply for a standard cultivation licence, as well as a standard processing licence. However, the Minister may refuse to issue a licence.

In 2018 when recreational cannabis become legal in Canada, a processing firm could only sell fresh and dried cannabis, cannabis oil, plants and seeds. Nevertheless, in October 2019 new regulations came into force allowing processors to also sell cannabis edibles, extracts, and topical products. (Bluesky, 2019)

5.3.3 United States of America

In the USA, states are split into two groups around recreational cannabis processing. The first and largest group are states requiring processors to obtain a separate recreational cannabis processor licence in order to process raw cannabis into cannabis products. States in this group include Alaska, California, Massachusetts, Maine, Oregon, and Michigan. Firms with a processor licence do not have any other restrictions placed on them in terms of volume, potency, or types of processed products.

For the second group of states, firms just need a recreational cannabis licence. This licence allows firms to cultivate and process their own cannabis or process other firm's cannabis. States in this group include Colorado, Illinois, Nevada, and Washington. Once again there are no restrictions placed on the firms in terms of the volume they can process, the potency of the products, or what products they turn the cannabis into. (Skodzinski, 2019)

5.3.4 Applicability in New Zealand

Across all three countries, it is recognised that only licenced firms can process raw cannabis into cannabis products ready for retail. Specific licencing requirements do vary across the three countries.

Of note, apart from the one year delay in Canada around the production of edibles, both Canada and the USA have very little regulations around potency and the types of cannabis products that can be produced. Most regulations are aimed at ensuring that the cannabis products do not appeal to children, and that products are labelled with their THC and cannabidiol (CBD) levels.

The proposed approach in New Zealand around licencing processors, and ensuring that the cannabis products do not appeal to children, is consistent with what occurs in other countries. In addition, we need to ensure that if recreational cannabis is legalised in New Zealand, limits on product potency and product type are implemented into licencing requirements, or the legislation, rather than retrospectively removing products once product issues emerge.

5.4 Advantages of proposed recommended model

Overall, BERL considers the recommended model to have a number of advantages. These advantages can be summarised as:

- Unrestricted ability for recreational cannabis cultivators to vertical integrate
- Decreased administration burden
- Lower barriers to entry
- Increased competition.

While the recommended model does not limit the number of firms that can hold a recreational cannabis processing licence, this stage of the supply chain is limited by the amount of cannabis that will be produced by the quota, and the operational requirements of the producing licence. The lack of licence limits means that any firm that holds a recreational cannabis cultivators licence and a percentage share of the recreational cannabis quota could vertically integrate at any time, and set themselves up as a processor. They then would be able to process their own cultivated cannabis, as well as any other raw cannabis they could obtain from other recreational licenced cannabis cultivators. The alternative models effectively limit the number of recreational cannabis processors, either through a hard limit, or through the soft limit of needing to obtain recreational cannabis processing quota from other firms already in the market.

Under the recommended model, there is no requirement for the regulatory authority to monitor firms to ensure they stay within their processing quota, or to place other restrictions on volume or products. This lowers the administrative burden on the regulatory authority as well as costs. Lower administrative costs are reflected by a lower levy to the recreational cannabis industry. The lack of restrictions on processing firms also lowers their administrative burden. Firms will need to ensure they keep meticulous records of all cannabis processed. Otherwise, under the recommended model, they simply process as little or as much cannabis as they wish.

In addition, the recommended model has low barriers to entry, with a new firm not needing to purchase processing quota, or bid for one of a limited number of licences. To enter the processing sector of the recreational cannabis industry, a firm must hold a recreational cannabis licence and then apply for a processing module. Other than this, it needs the capital to purchase the equipment needed to process the raw cannabis into products.

The low administrative barrier to entry, and the ability of cultivators to vertically integrate, means that under the recommended model there will be competition in the processing sector of the recreational cannabis industry. While it is unlikely there will be a large number of firms in the sector, the model will ensure processing firms will be more restricted in their ability to increase prices to the retail sector and monopolise processing sector profits. Because the main barrier to entry in processing is initial capital requirements, any firm able to obtain a recreational cannabis processing licence with the necessary capital could set up as a processor, and undercut any firm seeking to make excessive profits in the sector.

6 Proposed retailing model

The retail sector can be defined in the recreational cannabis industry, as the portion of the industry that takes processed cannabis products (described in section 7.2), and retails these products to consumers throughout New Zealand.

6.1 Recommended model – unrestricted

The recommended model for firms and individuals to acquire a retail module for their recreational cannabis licence is an **unrestricted model**. Under this model, any firm or individual who holds a recreational cannabis licence may apply for, and receive, a retail module for their licence without any restrictions applied to them. Licence standards will apply around where they can setup their retail locations. For small rural locations, we recommend a restriction that retail firms must operate as a combined store (allowing for the sale and consumption onsite of recreational cannabis).

An individual or firm with a retail module on their recreational cannabis licence can obtain cannabis products from a licenced processor, and run one of three types of cannabis retail firms. Retail firms include:

- Retail stores – which sell recreational cannabis and cannabis accessories to the public
- Licenced premises – which sell recreational cannabis for consumption onsite, and non-alcoholic beverages and food
- Combined stores – which combine the function of a retail store and a licenced premise.

6.2 Expected retail locations

Under the recommended model, BERL would expect that once the market is established, New Zealand will have approximately 420 stores spread across the country. These stores will range from single retail stores in smaller townships, such as Kaikoura or Kaitaia, to well over one hundred retail stores spread across Auckland. These stores are expected to have coverage across New Zealand as shown in Table 6.1. On average, this is one store per 8,660 people.

Table 6.1 Suggested number of financially viable retail stores

Retail markets	# of financially viable retail stores	2018 Population over 20yrs	Population per store
Auckland	125	1,260,700	10,090
Wellington	27	317,300	11,750
Christchurch	25	297,500	11,900
Hamilton	14	121,600	8,690
Dunedin	9	98,500	10,940
Tauranga	10	99,400	9,940
Whangarei	11	66,400	6,040
New Plymouth	8	60,200	7,530
Whanganui	6	33,400	5,570
Taupo	5	27,500	5,500
Rotorua	9	51,400	5,710
Whakatane	5	25,500	5,100
Gisborne	7	34,100	4,870
Napier	7	46,300	6,610
Hastings	9	57,300	6,370
Palmerston North	9	64,800	7,200
Nelson	5	39,500	7,900
Invercargill	6	41,200	6,870
Ashburton	3	25,600	8,530
Queenstown	2	30,800	15,400
Rural Townships	117	827,900	7,080
Total New Zealand	419	3,626,900	8,660

Source: BERL 2019

6.2.1 Financial viability of retail stores

The following sets of tables show the minimum volume of dried cannabis or equivalents that retail stores would be expected to sell. As stores are expected to vary in demand based on their area and urban density, three sets of tables have been presented. Table 6.2 presents the expected revenue and costs of retail firms in a major urban area (Auckland, Wellington, Christchurch, etc...), Table 6.3 presents costs and revenues in a minor urban area (Whangarei, Palmerston North, etc...), and Table 6.4 presents the costs and revenues in a rural township (Kaikoura, Kaitaia, etc...). These tables also state the minimum quantity these stores would need to sell to consumers in order to achieve a reasonable level of profitability that would ensure their financial viability.

For major urban centres, retail firms would need to sell the following amounts annually (Table 6.2):

- 150 kilogram for retail stores
- 100 kilogram for licenced premises
- 150 kilogram for combined stores.

Table 6.2 Major urban centre retail firms financial summary

Major Urban Centre	Retail Store	Licensed Premise	Combined Store
Volume of dried cannabis (grams)	150,000	100,000	150,000
Revenue (\$)	4,973,000	3,520,000	5,849,000
Costs (\$)	4,405,000	3,337,000	5,248,000
Profit (\$)	568,000	183,000	601,000

Source: BERL 2019

For minor urban centres, retail firms would need to sell the following amounts annually (Table 6.3):

- 110 kilogram for retail stores
- 75 kilogram for licenced premises
- 110 kilogram for combined stores.

Table 6.3 Minor urban centre retail firms financial summary

Minor Urban Centre	Retail Store	Licensed Premise	Combined Store
Volume of dried cannabis (grams)	110,000	75,000	110,000
Revenue (\$)	3,647,000	2,640,000	4,303,000
Costs (\$)	3,254,000	2,519,000	3,862,000
Profit (\$)	393,000	121,000	441,000

Source: BERL 2019

For rural townships, retail firms would need to sell 100 kg annually. This would generate a revenue of almost \$4 million, and a profit of \$385,000 (Table 6.4).

Table 6.4 Rural township retail firms financial summary

Rural township	Combined Store
Volume of dried cannabis (grams)	100,000
Revenue (\$)	3,966,000
Costs (\$)	3,581,000
Profit (\$)	385,000

Source: BERL 2019

6.3 Retail models in other legal markets

Retailing has a wider array of models in other legal recreational cannabis markets compared to other sectors of the industry. Store locations, types of stores, online sales, and Government operational involvement, all vary significantly.

6.3.1 Uruguay

In 2013, Uruguay became the first country to legalise recreational cannabis. In 2014, the country legalised cultivating up to six plants at home, the formation of cannabis clubs, and a state-controlled cannabis dispensary regime. Consumers are able to access cannabis through one of these three ways: home-grown, purchased at a pharmacy, or obtained through a cannabis club. Each consumer though must choose and register with the state, which one of the three ways they wish to obtain cannabis, and are thereafter locked into accessing cannabis through that channel.

Currently there are just 17 pharmacies across Uruguay providing cannabis to the public. In addition, the sale of cannabis is heavily controlled by the state. Currently, a gram of cannabis is being sold for US\$1.30 in pharmacies, of which about 90 cents goes to the producer. A small fraction goes to the government, with the pharmacy receiving the rest. According to the Uruguay Cannabis Regulatory Institute (IRCCA), only 32,000 people are registered to legally buy recreational cannabis from one of the 17 pharmacies. Of these, effectively 23,620 bought in pharmacies at least once since the beginning of sales in July 2017. The average monthly purchase was 7.8 grams per month, per buyer.

Registered cannabis clubs can be formed by 15 up to 45 adults and registered with the Uruguay government. Each cannabis club has a legal limit to cultivate up to 99 plants at a time, with members able to receive up to 40 grams of cannabis per month. In order to support the cultivation of the cannabis plants, most clubs charge members a sign-up fee as well as a monthly fee. Finally, anyone wanting to cultivate their own cannabis needs to register with the government. They are then able to cultivate up to six plants at a time for personal consumption.

6.3.2 Canada

In Canada, cultivation and processing is federally licenced, but retail is state licenced. Overall, in almost all Canadian provinces, the province has a monopoly online store (only Saskatchewan and Manitoba allow private online stores), while allowing private firms to operate physical retail stores. Across the provinces, the provincial governments have placed a variety of restrictions on the number of retail stores allowed to be operated by one chain or firm. In Ontario, firms are allowed a maximum of 75 stores, while Alberta allows a maximum of 15 percent of stores to be operated by one firm. British Columbia allows a maximum of eight stores, and Saskatchewan and Quebec only allow a small number of retail stores to be privately operated. (Cannabis Compliance, 2018)

6.3.3 United States of America

In the USA, states that have allowed recreational cannabis have also generally imposed no restrictions on the number of retail stores allowed in the state, apart from the need to have a licence to operate. However, in a number of states, local municipalities have been allowed to have direct control over the ability of retail stores to locate themselves in that area. For example, in California and Colorado, local counties and municipalities can make it illegal to operate a cannabis retail store in their area, despite it being legal at the state level. In California, the majority of municipalities have exercised this ability, making cannabis stores legal in only around a third of the state. (Mcgreevy 2019)

In addition, most states place some restrictions on retail advertising. For example, Colorado bans advertising to underage audiences, while allowing only physical advertising in the same lot as the store. Washington bans advertising within 1,000 feet of schools and playgrounds, and has limits on the wording and imagery of billboard advertising. Oregon has no restrictions on advertising. (Sesto, 2019)

6.3.4 Applicability to New Zealand

In Canada, provincial restrictions on the number of stores a firm can operate has led to firms looking to concentrate their limited number of stores into the larger urban areas of the state, where there are larger numbers of potential customers. This has led to an imbalance in the location of stores across the state, limiting access to physical stores. The availability of an online store has somewhat mitigated this lack of physical access.

In the USA, we need to learn from the lesson of California. While recreational cannabis is legal to sell in the state, two thirds of California's 540 local counties and municipalities have enacted local laws banning the sale of recreational cannabis in their territory. This has meant that while recreational cannabis is legal in the state, there are large areas of the state with no legal cannabis retailers. As a consequence, the illegal market thrives in many parts of the state.

For New Zealand, these examples show the need for central and local government to work together to ensure that cannabis retail stores are able to be spread around the country. Limits of store numbers, and/or restrictions on opening retail stores, will see the continued proliferation of the illegal market. This is because people will need local stores to cater for their cannabis consumption with no online stores proposed to be available.

6.4 Advantages of proposed recommended model

Overall, BERL considers the recommended model to have a number of advantages over the two alternative models considered. These advantages can be summarised as:

- Decreased administration burden
- Lower barriers to entry
- Increased competition.

The recommended model does not limit the number of firms that can hold a recreational cannabis retail licence. To obtain a recreational cannabis retail module, the firm simply needs to hold a recreational cannabis licence. Under the recommended model, there is no requirement for the regulatory authority to monitor firms to ensure they stay within their retail quota or retail location. This lowers the administrative burden on the regulatory authority as well as their costs. Lower administrative costs are reflected in a lower levy to the recreational cannabis industry. The lack of restrictions on the retail firms also lowers their administrative burden. Firms will need to ensure they keep precise records of all cannabis sold. Under the recommended model, they are able to retail as little or as much cannabis as they wish.

The recommended model also has low barriers to entry, with a new firm not needing to purchase retail quota, or bid for one of a limited number of licences. To enter the retail sector of the recreational cannabis industry, a firm must hold a recreational cannabis licence and a retail module. The firm also needs the capital to establish and fit out a suitable retail space.

The low barrier to entry and a lower administrative burden, means that under the recommended model, there will be competition in the retail recreational cannabis sector. While increased

competition may not result in a large number of firms in the sector, it will ensure that they will be more restricted in their ability to increase prices to consumers and monopolise recreational cannabis retail profits. With the main barrier to entry being the capital requirements of setting up, any firm able to obtain a recreational cannabis licence, source products from a cannabis processor, and have the necessary capital, could setup as a retailer and undercut any firm seeking to make excessive profits in the sector.

6.5 Disadvantages of proposed recommended model

Restricting access to online sales comes with a number of challenges. Firstly, there are challenges in providing legal access to recreational cannabis in rural communities that are unable to support a retail store. Restricting online sales will limit rural communities that cannot sustain a retail store to home-grown cannabis, micro-cultivators and the illegal market. If micro-cultivators have sufficiently low barriers to entry, it is possible that they will be able to compete effectively with the illegal market.

7 Proposed licencing model for New Zealand

This section outlines the recommended licencing approach for legal recreational cannabis in New Zealand. This structure is based on BERL research and modelling, and takes account of the proposed medicinal cannabis regime. This licencing model will allow the regulator to have control over the participants in and activities of the recreational cannabis market, by having specific conditions for each type of licence. If licence conditions are not met, or required practices are not followed, the regulator will be able to remove the licence, or deny applications to have a licence issued.

In all international legal markets, the recreational cannabis supply chain is licenced from cultivators through to retailers. The licencing regime is used to ensure that participants in the market operate with specific conditions relating to business operations and product safety. Common conditions include security requirements, logging staff presence on-site, and having a licenced supervisor on-site at all times. Some jurisdictions also require licenced cannabis products to be tracked from seed to sale, requiring licenced market participants to provide the necessary information. A summary of our analysis is available in Appendix G.

7.1 Central regulator allocating licences

BERL proposes that a central regulator would be responsible for administering a recreational cannabis licencing regime, including issuing licences. The regulator will be able to impose requirements on licensees, including fit and proper person tests, and requirements surrounding the specific activity undertaken.

Due to the complexity of developing and executing a totally new regulatory model that will span across various government departments, it might be efficient to have it housed within its own entity, for example a government department or a Crown agency.

7.2 Application for a cannabis licence

Applications for a cannabis licence should be a relatively straightforward process. As no limit to the number of licences is recommended, applications will simply need to demonstrate to the regulator, that the conditions of the licence will be met, and will continue to be met for the duration of the licence.

Provided the application meets the requirements of the licence (based on objective tests), the licence should be granted.

The requirements for obtaining a licence should ensure that participants in the market comply with recreational cannabis regulations, and should be set by the regulator with respect to the following factors:

- Security
- Personnel (fit and proper person test)
- Operational requirements, including regular reporting to the central regulator.

Any further requirements will depend on the objectives and restrictions agreed to by Cabinet.

7.3 Single modular licence

Participants in the legal recreational cannabis market will be required to be licenced at all points of the supply chain. BERL recommends a single licence model, with additional modules, as well as a combination of fixed and variable cost recovery fees for firms in the market. The fees for obtaining and maintaining a licence should be charged by the regulator on a cost-recovery basis.

7.3.1 Pre-application for recreational cannabis licence

The proposal includes a licence pre-application process. This phase will be a requirement to participate in the initial licence allocation process. The aim of this will be to gauge how many entities (and at what quantities) will be interested in entering the recreational cannabis market at each point in the supply chain. We propose this process is covered by a fixed fee collected on a cost-recovery basis.

7.3.2 Cost recovery fees

The initial licence fee should be set on a cost-recovery basis for the initial application, while ongoing licencing fees will cover the enduring operational costs of the regulator. As each licence module will have specific requirements, we recommend applying a fee based on the expected resource needed for processing licence applications. This should be set at a fixed fee for each module.

Ongoing fees should also be set on a cost recovery basis, equal to the ongoing monitoring, regulation, and enforcement costs of the regulator. As larger firms will require more detailed reporting to ensure compliance, this should be set on a variable basis. This will be charged at per gram of dried cannabis or equivalent output at cultivation, processing, and retail points. This structure promotes efficiency of the regulator in performing its role in the market, allowing the market to function efficiently while also being fair to firms in the industry by charging the ongoing costs based on their market share.

7.4 Licence modules

The modules proposed will reflect the medicinal cannabis structure, with separate modules for cultivating, processing, and retailing. Application costs and ongoing costs of these modules can be set by the regulator on a cost-recovery basis, depending on the regulation for each position in the supply chain.

7.4.1 Micro licences

We propose sub-modules for micro-cultivators. Micro licence holders will be subject to the same commercial controls of the regulated licensing regime as other licenced cultivators and processors including quality standards. Only one micro licence will be permitted per entity. Entities that have received a quota allocation will not be eligible for a micro licence. The amount of licences will be limited as part of the production cap and allocated on a 'first come first served' basis and according to the licencing objectives of the regulatory regime.

The micro-cultivator module can serve a number of roles in reducing the scale of the illegal market, while also increasing the availability of legal recreational cannabis to rural communities. For individuals currently engaged in the illegal cannabis market, this presents an opportunity to legitimise their enterprise. In addition, as there will be no online sales permitted, this presents an

opportunity for rural communities with limited populations, but available cultivation space, to have access to legally produced recreational cannabis.

This licence would exist outside the quota model and have reduced licencing fees, though with significantly reduced production limits. We propose a limit of 100 kilograms of dried cannabis per micro-cultivator. This is comparable to micro-producer licences in Canada, where the limit is 200m² of cultivation space. It is also similar to Oregon where Micro Tier 1 licences allow for 2,500 square feet (232m²) of outdoor cultivation area or 625 square feet (58m²) indoor cultivation space. California offers multiple micro licences, with the largest allowing up to 5,000 square feet of cultivation area.

This licence should also allow micro-cultivators to process their own product, or to sell their product to a commercial producer. These cultivators will not be able to process cannabis cultivated by other micro-cultivators or by commercial cultivators.

7.5 Proposed licence renewal scheme

BERL proposes that the licences are renewed annually. For a licence to be renewed, the regulator needs to audit the licence holder to ensure they have met all of their licence conditions. If the regulator is satisfied with the results of the audit, they will then renew the licence holders recreational cannabis licence for the next year. If the regulator is unsatisfied with the results of the audit, the regulator will act in line with their regulatory authority.

As long as the applicants continue to meet the requirements of the licence, their quota will last for a period of five years. After five years, all licensees have to reapply for their production quota. This will allow for new entrants into the market and will ensure that the market is not closed to only a few early entrant participants. It may create some uncertainty for licence holders, although we are confident that five years is a feasible option.

8 Proposed taxes, levies, and duties

While legalised recreational cannabis promises to establish a sizable legitimate industry, it comes with heavy administrative costs. We recommend seed-to-sale tracking systems, with production facilities inspected and held to standards, and a licensing system to process and register producers and sellers of cannabis. This provides a much higher control over the market, including ensuring that illegally grown cannabis does not enter the legal retailing market. Cannabis that does not meet testing standards would also be able to be tracked back to the source to ensure the products reaching the consumer meet the required standards.

All of these come at a cost. On top of administration costs, the burdens placed on health care and social services will have to be factored in, with increased funding for support services for people through health, social and education.

This mix of fees, excise duties, and Goods and Services Tax (GST) will ensure the government and taxpayers aren't unduly burdened by the regulation of the recreational cannabis industry. For the first two years (at least), it will be difficult to accurately forecast the operational costs of overseeing the industry. Moreover, further policy, tax, and legal issues may arise and have to be addressed. Based on BERL modelling, we recommend the following fees, taxes, levies, and duties, be gathered by a central regulator on a quarterly basis from the legal recreational cannabis industry:

- Licencing fee
- Harm reduction and social equity levy
- Excise duty
- GST.

Based on our current modelling, the licencing fee, harm reduction levy, and excise duties, will be approximately \$10 per gram of cannabis sold. This is very high by international standards, though with a high illegal price currently in New Zealand, this is expected to be competitive with the illegal market.

8.1 Licencing fee

In order to recover the costs of administering the recreational cannabis licencing regime, the regulatory authority will apply a licencing fee across all commercial sectors of the recreational cannabis industry: cultivating, processing, and retailing.

BERL estimates that the annual cost of administering the recreational cannabis licencing regime will be around \$30 million. For comparison the Financial Market Authority and the Electricity Authority have annual appropriations of between \$40 and \$75 million, while WorkSafe has an annual appropriation of \$94 million.

8.2 Harm reduction and social equity levy

Given that two of the key objectives of creating a legal recreational cannabis market are to reduce cannabis harms and social inequity, it is important that a portion of the revenue generated by the legal recreational cannabis market go directly into harm reduction and social equity. By creating a specific levy to fund cannabis harm reduction and social equity, the recommended model is ensuring that substantial and consistent funds are available to resource these.

Harm reduction funding will enable work to be carried out through education programmes, intervention services, research and evaluation, and public health services. Provision of education services will enable the public to be better informed about cannabis use and its risks. In addition, members of the public who are negatively affected by cannabis use will be able to seek help through public health and intervention services.

As social equity is about creating opportunities for people who have been adversely affected by cannabis use or cannabis enforcement, the levy funding could be used in a variety of ways. These may include:

- Helping communities that have been disproportionately impacted by cannabis use and cannabis enforcement to create educational and economic opportunities for community members
- Helping communities build social capital and strengthen their communities, so that people can work together to derive ongoing community benefits
- Redressing social inequalities within communities created by the cannabis prohibition approach.

Therefore, it is proposed that \$4 per gram of dried cannabis or equivalent is collected from licenced recreational cannabis processors on cannabis products supplied to retailers. Levy collection will occur at the same time as the cannabis excise duty collection. By combining the collection of fees, levies, and duties, the compliance and administrative burden on the processors, the regulatory authority, and New Zealand Customs is reduced. Moreover, it makes practical sense to collect it together. With a maximum of 110 tonnes of dried cannabis or equivalent being processed each year by licenced cannabis processors (including micro-cultivators), the harm reduction levy would raise a maximum of \$440 million a year.

8.3 Excise duty

Under the recommended model, a recreational cannabis excise duty is proposed for the following two reasons:

1. To ensure that all recreational cannabis products are sold in retail stores at a reasonable price
2. To ensure that higher tetrahydrocannabinol (THC) products are sold at higher retail prices. This will remove some, if not all, of the encouragement for cultivators and processors to focus on high THC products due to the quota cap on recreational cannabis production.

Taking into account the reasons for having a recreational cannabis excise duty, it is recommended that different rates of excise duty are charged based on the THC level of the cannabis product being supplied to the recreational cannabis retail sector. Applying these different rates of excise duties will ensure a reasonable minimum price per gram for dried cannabis products or their equivalents of different potency.

During the processing phase, a variety of final recreational cannabis products for public consumption will be created. All recreational cannabis products, prior to being supplied to retailers, will need to be tested for their THC levels, and then be labelled with these levels. Therefore, it is during this phase when volume and potency of each product is known, that the excise duty will be collected, as it will be far easier for the regulatory authority to administer and gather the excise duty from the processor.

8.4 Goods and Service Tax (GST)

In New Zealand, a tax of 15 percent is charged on the sale of all goods and services in New Zealand. In total, the amount of GST raised by the sale of cannabis will depend on the final sale price of cannabis in retail stores. Using the suggested minimum prices of \$20 for low THC products, \$30 for medium THC products, and \$40 for high THC products, it is likely that a total of \$335 million in GST will be raised by the sale of 110 tonnes of recreational cannabis.

Legal recreational cannabis products attract taxation in every state or province of the United States of America (USA) (where legal), Canada, and Uruguay. Rates of taxation, levies, and fees, and their purpose, vary significantly.

8.5 Cost, profit, levies, duties, and tax allocation for the supply chain

In New Zealand, the price for a gram of cannabis has remained constant for the past few decades. Being an island nation with little competition from neighbouring jurisdictions, the legal market is expected to be able to compete with the illegal market at a price of approximately \$20 per gram. Table 8.1 sets out the indicative costs, levies, duties, profit margins and taxes for each gram of cannabis sold. The profits and costs at each level of the supply chain are estimates based on BERL modelling, while the excise duty and licencing fees will be set by the regulator. An 11 cent per gram contingency margin is also added as an approximation of the cost for initial licencing fees, cost recovery regulatory fees, and other minor expenses.

Table 8.1 Supply chain financial summary

Supply Chain Summary	\$ per dried gram
Retail price including GST	20.00
Retail price excluding GST	17.39
Components of retail price	
Retail costs	2.37
Retail profit	0.90
Processing cost	0.57
Processor profit	0.90
Growing costs	2.04
Growers profit	1.00
Excise duty	5.50
Harm minimisation levy	4.00
Contingency margin	0.11
Total	17.39

Source: BERL

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Appendix A Methodology – market estimate

This research was informed by BERL research into the expected extent of the legal recreational cannabis market in New Zealand. This research includes estimating the total current use in New Zealand, and how this use would be expected to change post legalisation in New Zealand.

Baseline estimates

The aim of the baseline market estimates was to establish the total consumption of cannabis, based on frequency of use and demographics.

New Zealand Alcohol and Drug Use Survey 2007/8

The New Zealand Alcohol and Drug Use Survey (NZADUS) is the most recent large survey with comprehensive data available on magnitude and pattern of drug use of people in New Zealand. Conducted by the Ministry of Health (MoH), the survey collected information on 6,784 New Zealanders aged 16–64 years, including 1,825 Māori and 817 Pacific respondents. For this research, MoH provided the survey responses in the format of a Confidentialised Unit Record File (CURF).

The survey oversamples Māori and females as compared to the total New Zealand population, and this is considered when making inference about the total population. The results of this analysis are used to calculate the total amount of cannabis used in New Zealand, which is a direct input into the calculation of the total market for cannabis.

Group classifications

The model estimates the total cannabis market in New Zealand by analysing user groups in the NZADUS and multiplying them with the size of that population group in New Zealand. The user groups are classified by age, sex, ethnicity (European, Māori, other), deprivation and frequency of cannabis use.

The level of cannabis use is determined by the three primary questions about cannabis use in the NZADUS.

- “Have you ever tried cannabis?”
- Have you used cannabis in the last 12 months?
- In the last 12 months, how many times have you used cannabis?

From the population of people who reported they have tried cannabis in the last 12 months, groups were formed according to the reported frequency of use over this period.

These groups are defined as follows:

- **Daily** – response of: “Daily”, or “5-6 times a week”
- **Frequent** – response of: “About 3 – 4 times a week”, “Twice a week”, or “Once a week”
- **Periodic** – response of: “2 - 3 times a month”, “Once a month”, “Once every 6 weeks in the last 12 months”, or “3 – 6 times in the last 12 months”
- **Rarely** – response of: “1 or 2 times in the last 12 months”, “Never in the last 12 months”¹.

¹ This is a very small group of individuals who have answered inconsistently with the previous question

Those who answered “Don’t know”, or “I don’t want to answer” were excluded, as per those who reported that they have not used cannabis in the past 12 months.

Data assumptions

The NZADUS has relatively low number of observations of ethnicity other than Māori or European. These other ethnic groups also have lower cannabis use rates than Māori and Europeans. Due to both of these factors, for some groups, no respondents indicated that they had used cannabis in their lifetime. As there are very few individuals of ‘other’ ethnicity sampled in the NZADUS, and the relatively low cannabis rates for this group, many user groups do not have a sufficient number of individuals to identify cannabis use. For these groups, we have assumed a minimum cannabis use rate of one percent of the total population. When divided further into deprivation, for each deprivation quintile the minimum use is one tenth of a percent.

Quantity of cannabis used

To estimate the quantity of cannabis used by each use group, rates have been obtained from Cooper, et al., (2016). This study uses data from the United States National Survey on Drug Use and Health (NSDUH) 2010-2013 to estimate the total use in grams for each group. Daily users use 1.6 grams each day they consume cannabis, while all other use groups use 0.67 grams on each occasion.

New Zealand Health Survey 2016-17

The New Zealand Health Survey (NZHS) provides information about the health and wellbeing of New Zealanders. The NZHS became a continuous survey in 2011, enabling the publication of annual updates. For this research the data accessed was in the format of a CURF.

In analysing the responses to the adult survey, the question, “In the last 12 months, have you used any of the following drugs for recreational or non-medical purposes, or to get high?”, was used to identify those who use cannabis. Further analysis was conducted only on those individual records where the answer to this question was “Yes” to cannabis (marijuana, hash, and hash oil). As there is no information in the NZHS regarding amount or frequency of use, the outcomes were only able to be measured for individuals that use cannabis at any level.

This data has been used as a comparator to the NZADUS to check for consistency between the findings. Survey results from 2013-14, 2014-15 and 2015-16 were also examined to look for consistency of patterns over time, as well as the 2006-07 results, being the same time period the NZADUS was conducted.

Cannabis use of people over 65 years old

The NZADUS does not include any data for individuals aged over 65. As there is information held for this group in the NZHS, the rates of use for the over 65 years old group have been scaled based on the difference in use rates for each group in the NZHS.

As the NZHS does not present any information regarding the frequency of use, the distribution of these users have been applied to the four use categories following the proportion of users of 55 to 64 years old.

New Zealand population information

As the NZADUS is from 2007, establishing a 2018 baseline requires updating to the current New Zealand population. To establish the current scale of cannabis use in New Zealand, population counts and breakdowns of age, sex, ethnicity and deprivation, the following projections from Statistics New Zealand (StatsNZ) were used:

- New Zealand national ethnic population projections by age, 2013-2018
- New Zealand national population estimates by age and sex, 2013-2018
- New Zealand national population estimates by age, sex and territorial authority
- New Zealand 2013 Census ethnic group by age and sex.

In addition to the University of Otago New Zealand Socioeconomic Deprivation Index (2006 & 2013).

The use rates for each group of age, sex, ethnicity and deprivation from the NZADUS and NZHS have been scaled according to the respective population changes. This forms the 2018 estimate of cannabis use in New Zealand for the total population.

Post legalisation scenario modelling

The model is constructed to allow a user to determine certain parameters creating a post legalisation scenario. The resulting market and associated harms can then be compared with the current situation, or an alternate set of parameters. This section explains the parameters provided and their interaction, as well as the calculations of associated harms. See Appendix A for the formulas used to apply these parameters.

Elasticity of demand

Price elasticity of demand for cannabis

Drug demand responsiveness to price changes is studied fairly extensively for a range of drugs. However, no clear consensus exists on the direction and magnitude of effects for cannabis specifically. A number of New Zealand and international studies were assessed, from which some broad themes emerged:

- Participation elasticity: Young people (under 20) are price sensitive in choosing to initiate cannabis use. A higher price delays the age of initial use
 - This initiation delay does not appear to hold for those aged over 20
- Heavy users do have a degree of price sensitivity despite the need to continue consumption to satisfy a dependency
- People who consume less cannabis have a larger price sensitivity than heavy users.

Separate to price effects, it is possible that legalisation itself has a positive effect on both the amount people use, and the initiation of use. Other non-price effects include societal approval and enforcement levels.

A literature review by Pacula and Lundberg (2014) identifies several studies which attempt to quantify the price elasticity of cannabis. The studies examined were conducted in jurisdictions where recreational cannabis was illegal at the time, although some had legal medical cannabis

markets. Contributing non-price factors were controlled for in some studies, though methods varied. The elasticities arrived at in these studies ranged from -0.002 to -0.69.

A later study by Hansen, Miller and Weber (2017) conducted in Washington State, which has legalised recreational cannabis, found that the price elasticity in a legal market is higher than in an illegal market. The estimate arrived at was -0.85.

Within the model the elasticity is parameterised meaning it can be adjusted by the user to observe the effect on the market of a higher or lower elasticity. The sensitivity of higher frequency users is likely to be less elastic than for less frequent users.

Within the model a parameter is provided to enable scenarios where an illegal market persists. The user can nominate the proportion of total sales which will occur in the legal and illegal markets and observe the resulting impacts on the harm indicators.

Cross price elasticity

The rate of substitution to the illegal market with respect to price is based on the cross price elasticity of illegal cannabis with legal cannabis. For each percentage increase in the legal price, the level of cannabis consumed from the legal market will increase by the cross price elasticity coefficient.

Extent of the illicit market

In no jurisdiction where cannabis has been legalised has the illegal market been completely removed. It can be expected that a black market will continue to some extent within New Zealand. A base level parameter is provided to allow the user to influence the share of the legal market. The end outcome will be determined by a variety of influences including policy settings, social factors and the accessibility of the new legal market.

Changes in indicators

Health, education and labour force status outcomes

The changes in these indicator outcomes are based on the total level of cannabis use. The harms in each category are based on the total harm per kilogram consumed and the change in the level of use over time. The change in the level of use in the regulated scenario is a combination of change in the number of users, and the change in the amount used per user.

Justice outcomes

The magnitude of the justice harms are based on two characteristics, the size of the illicit market, and the penalties for breaching the new legislation. The overall level of offending is based on the size of the illicit market, as compared with the 2018 benchmark levels of production and consumption. The level of each type of offending is scaled based on this ratio.

Appendix B Processing model alternative models

In addition to the recommended model, two alternative models were also considered, these were:

- A licence auction with limited number of licences available
- A quota allocation model.

Licence auction model

Up to 12 processor licences would have been auctioned off to recreational cannabis licence holders under the licence auction model considered. Each licence holder would under this model be able to process as little or as much cannabis as they are able to purchase from licenced cultivators. Under this model, no firm with a cultivators licence would be able to hold a processing licence as well.

Given the substantial capital requirements of setting up a commercial processor, it was thought that no more than 12 firms would be able to setup standalone large processing firms in New Zealand and remain financially viable. It was estimated that around \$1.5 million in machinery and other capital expenditure would be required for every tonne of dried cannabis or equivalent to being processed, plus operational costs of around \$3.8 million per tonne. With around 110 tonnes of dried cannabis or equivalent needing to be commercially processed each year, 12 processors would be able to process around 8-9 tonnes each a year (if market share was equal). Therefore, around \$13.5 million in capital investment plus finances for operational expenditure of around \$34.2 million, would be needed to set up operations and run them for a year.

Table 9.1 Capital costs, operating costs and revenue for processors per tonne

Processor	
Volume of dried cannabis (grams)	1,000,000
Capital Costs (\$)	1,534,000
Operating Costs - labour	238,000
Operating Costs - raw cannabis	3,045,000
Operating Costs - other	533,000
Total operating costs	3,816,000
Revenue (\$)	4,316,000
Profit (\$)	500,000

Source: BERL 2019

Quota allocation model

Under a proposed quota allocation model, the market share of recreational cannabis processing would be split the same as the cultivator's quota:

- 100 tonnes of quota would be auctioned off to buyers who have a recreational cannabis licence
- 10 tonnes would be reserved for micro-processors.

Under this model, the following restrictions would apply:

- Each of the two quota categories would be freely tradable to any firm with the same recreational cannabis processing licence (standard or micro)
- Within the micro-processing quota, firms would be limited to holding a maximum of one tonne of micro-processing quota.

Appendix C Retail model alternative models

In addition to the recommended model, two alternative models were also considered. These were:

- Limited licence allocation (limit of licences per area)
- Set quota licence allocation.

Limited licence allocation

Under a limited licence allocation model, a maximum of 420 licences would be allocated across New Zealand. These licences would be allocated in line with the suggested number of retail firms per area in Table 8.1. Using this allocation model, a maximum of 125 retail licences would be available for the Auckland region, while there would be two retail licences for Queenstown District. Given the limited nature of the retail licences under this model, the licences would be auctioned off, rather than issuing the licences on a first come, first served basis.

Set quota licence allocation

Under a set quote licence allocation model, each retail licence would come with a set quota limit based on the licence's location. Major urban retail licences would have a set quota of 150,000 grams; minor urban retail licences would have a set quota of 110,000 grams; and rural township retail licences would have a set quota of 100,000 grams. Under this model, retail licences would be auctioned off, rather than issuing the licences on a first come, first served basis.

Appendix D Social equity

The current market for illegal cannabis has a wide range of associated and potential harms. These harms may include physical and mental health concerns, and contact with the justice system. They affect cannabis users directly, and also result in financial costs through the health and justice systems.

While cannabis is currently illegal, it is widely consumed and has significant direct and indirect costs. A summary of direct hospital costs and justice costs (based on BERL modelling) are shown in Table 9.2. Combined, the financial costs of the justice system and hospitalisations range from \$29 million to \$60 million.

With just the costs of holding the court case and sentencing alone, the criminality of the cannabis market costs from \$14 to \$35 million per year. These costs include proceedings where cannabis is the most serious charge (low), and where a cannabis charge is present (high). Justice costs do not include the costs of policing, as the New Zealand Police do not allocate time to specific projects. In addition, these costs do not include judicial salaries.

The hospital costs include hospitalisations where a cannabis-related diagnosis was present (high), or where a cannabis-related diagnosis was the primary or secondary diagnosis (low). The direct costs of these hospitalisations range from \$15 million to \$26 million per year.

Table 9.2 Direct cost of cannabis harms

		Justice costs		Hospital costs	
		High \$000s	Low \$000s	High \$000s	Low \$000s
Age	15 to 20	1,442	480	2,910	2,286
	20 to 25	5,160	1,796	6,262	3,709
	25 to 30	7,258	2,115	5,345	3,447
	30 to 35	5,671	2,304	2,369	1,095
	35 to 45	7,328	2,825	4,089	1,608
	45 to 55	6,262	3,227	2,785	1,449
	55 to 65	1,236	900	1,528	725
	65 +	283	270	412	371
	Total	34,641	13,917	25,700	14,690
Sex	Male	29,083	11,723	19,624	11,087
	Female	5,556	2,193	6,076	3,602
	Total	34,641	13,917	25,700	14,690
Ethnicity	European	15,778	6,340	9,461	5,379
	Māori	15,603	6,257	12,325	7,207
	Other	3,260	1,320	3,915	2,104
	Total	34,641	13,917	25,700	14,690

Source: BERL 2019

Cannabis use is also associated with a number of long-term health conditions, particularly those affecting the cardiovascular and respiratory systems. In addition, cannabis use is associated with

higher prevalence of mental health diagnoses. These conditions have significant additional long-term costs, both in the hospital system and in social costs for communities. The associated harms of cannabis use disproportionately affect Māori and young men. As such the revenue generated through the harm reduction levy needs to be allocated accordingly.

Appendix E International taxes licences and levies²

Legal recreational cannabis markets around the world have varied political settings. One of the common forms of market regulation is licencing the supply chain. In this sub-section, we outline the licences and levies in the legal recreational markets in Canada and the USA.

Licencing fees

United States of America

Licencing fees vary the most significantly across the USA. As cannabis is illegal at the national federal level, each state has their own cannabis-related legislation. In many states, cannabis remains illegal for all purposes, though an increasing number of states have legalised cannabis for medicinal and recreational purposes. Depending on the extent that cannabis is legal, these states have a variety of state policies for managing cannabis. Within the states with established legal recreational cannabis industries, there are also differences in licencing fees and regulations.

Currently, Washington (state), Colorado, and Oregon have relatively inexpensive licences. Washington has the lowest licence fees, with an annual cost of \$1,381 and a \$250 application fee for all licence types. Oregon also charge a \$250 application fee, though annual licence costs range from \$1,000 for a micro-cultivator to \$5,750 for large-scale cultivators. Processors, wholesalers, retailers, and laboratories, all have annual fees of \$4,750.³ In Colorado, application fees are the highest at \$4,000, with fees up to \$5,300 for cultivators, and \$1,800 for retailers.⁴

Recreational cannabis licencing is much more expensive in other states, particularly California and Nevada. In California, each licence type has variable licence fees depending on the scale and type of firm. The fees are also collected through three different licencing agencies. For cultivating, whether cultivating indoor or outdoor and the type of light source, has a significant impact on licencing fees. Retail licencing fees range from \$2,500 per annum for stores with annual turnover under \$500,000, to \$96,000 for firms with turnover over \$7.5 million.⁵ For cultivation, the medium indoor licence, which the largest licence available, costs \$77,905 per annum. In Nevada, the recreational cannabis application fee is \$5,000 with additional initial licencing fees of \$20,000 for retail, \$10,000 for manufacturing, and \$30,000 for cultivation.⁶

Canada licencing fees

In Canada, licencing is conducted at the national level for cultivating and processing, with retailing licenced by an agency in each province, typically the provincial alcohol licencing authority. Annual fees for cultivating and processing is the lesser of \$23,000, or 2.3 percent of cannabis revenue. Micro-cultivation and micro-processing licences cost the lesser of \$2,500 or one percent of cannabis revenue. If micro-processors have revenue more than \$1 million, the additional revenue has an annual fee of 2.3 percent.

² All dollars amounts in this section are in local currencies.

³ Oregon Government – Recreational Marijuana FAQs: Licencing-General

⁴ Colorado Government – Cannabis Fees 20 August 2018

⁵ Bureau of Cannabis Control - Text of Regulations

⁶ Nevada Tax Commission 8 May 2017

Taxation

In legal recreational cannabis markets, cannabis regulation administration and funding cannabis-related harms have resulted in additional taxation. These taxes vary significantly, though typically are much lower than the proposed taxes and levies for New Zealand.

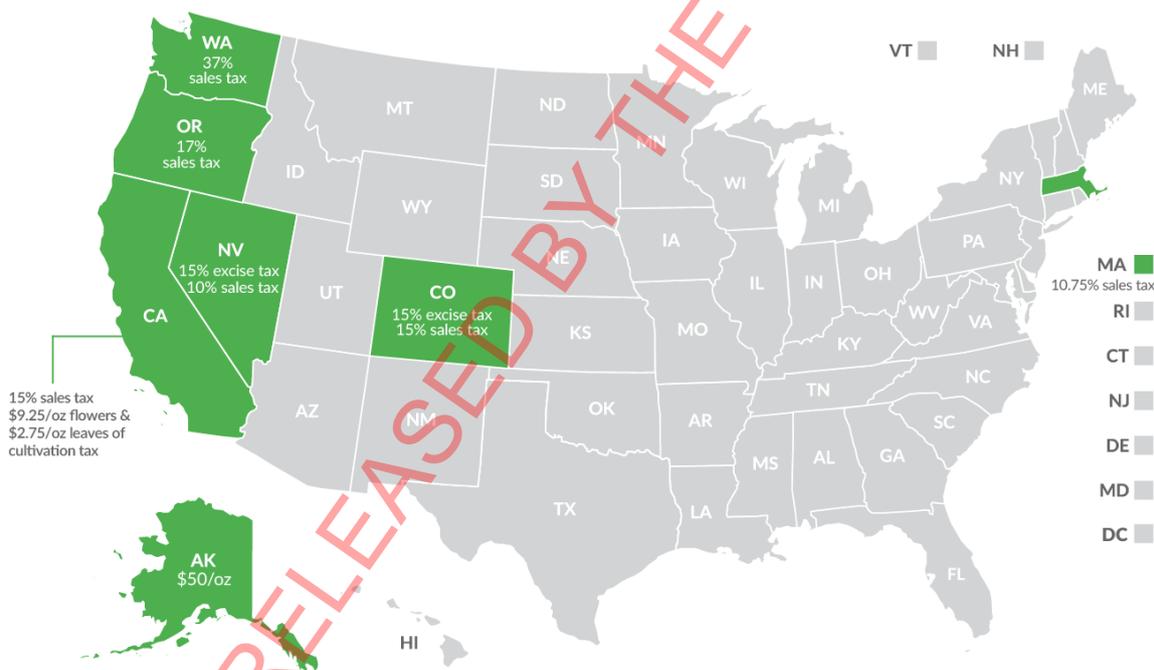
United States of America

In the established recreational market in the USA, sales taxes range from 17 percent in Oregon up to 37 percent in Washington. A summary of taxes in each legal state is shown in Figure 9.1. Each state collects a sales tax at the point of sale, while some states collect an additional excise duty at the point of production. The taxes in this figure are supplementary to general state sales taxes in each state, although there are no state sales taxes in Oregon.

Figure 9.1 Recreational cannabis taxes in the USA

How High Are Recreational Marijuana Taxes in Your State?

State Recreational Marijuana Excise Tax Rates, January 2019



Note: Michigan legalized recreational marijuana in 2018 by ballot initiative, but has until Dec. 6, 2019, to implement a legal market. Maine legalized recreational marijuana in November 2016 by ballot initiative, but the state is still working to create a legal market. District of Columbia voters approved legalization and purchase of marijuana in 2014, but federal law prohibits any action to implement it. In 2018, the New Hampshire legislature voted to legalize the possession and growing of marijuana, but did not permit sales. Alabama, Georgia, Idaho, Indiana, Iowa, Kansas, Kentucky, Louisiana, Minnesota, Nebraska, Oklahoma, Rhode Island, Tennessee, and Wisconsin impose a controlled substance tax on the purchase of illegal products.

Source: Bloomberg Tax; state statutes

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Canada

As recreational cannabis is legal nationally in Canada, cannabis duties are more consistent across the country. Canadian recreational cannabis duties are presented in Table 9.3, and are made up of two components: a national duty and a provincial duty. The rates charged are the higher of the

flat-rate and the ad valorem amount.⁷ Additional recreational cannabis duty is charged at the state level, with approximately \$1 of cannabis duty per gram.

Table 9.3 Cannabis duty in Canada⁸

Cannabis product	Cannabis duty		Additional cannabis duty (not applicable in Manitoba)	
	Flat-rate	Ad valorem	Flat-rate	Ad valorem
Dried/fresh cannabis	\$0.25/gram of flowering material \$0.075/gram of non-flowering material	2.5% of the dutiable amount for the cannabis product	\$0.75/gram of flowering material \$0.225/gram of non-flowering material	7.5% of the dutiable amount for the cannabis product
Cannabis plants and cannabis plant seeds	\$0.25/plant \$0.25/seed	2.5% of the dutiable amount for the cannabis product	\$0.75/plant \$0.75/seed	7.5% of the dutiable amount for the cannabis product
Cannabis oil, edible cannabis, cannabis extracts and cannabis topicals	\$0.0025/milligram of total THC	0% of the dutiable amount for the cannabis product	\$0.0075/milligram of total THC	0% of the dutiable amount for the cannabis product

In addition to these duties, the following provinces have additional sales tax adjustments on cannabis products:

- Alberta - 16.8 percent
- Nunavut - 19.3 percent
- Ontario - 3.9 percent
- Saskatchewan - 6.45 percent.

Manitoba applies a six percent social responsibility fee on cannabis retailing, while also charging between 0.75 and nine percent to the wholesale price.⁹

Uses of revenue from cannabis taxes

Cannabis tax revenue in most USA states is designated to specific purposes. Allocation of this revenue is presented in Table 9.4. In Canada, the revenue is not allocated to specific programmes, though the base cannabis duty is allocated to the central government, and additional duty is allocated to the provinces (Table 9.3). Typically, 75 percent of revenue is allocated to the provinces.

Relevance to the New Zealand context

Within the current international legal markets, there is not a compatible government structure to New Zealand. International models show that the oversight of the recreational cannabis regulations and taxes is normally positioned within various existing agencies, often liquor and/or gambling authorities. A significant amount of cross-agency work is also carried out dealing with the many regulatory touch points for the different parts of the industry.

International legal recreational cannabis markets have diverse taxes and levies that might not be appropriate for New Zealand. In Canada, there are central and regional taxes and levies, which will not be appropriate for the New Zealand context.

⁷ An ad valorem tax is a sales tax whose amount is based on the value of a transaction, typically imposed at the time of a transaction.

⁸ Department of Finance Canada, Cannabis Excise Duty Rates in Provinces and Territories

⁹ Manitoba - Cannabis Retailer Social Responsibility Fee And Wholesale Markups

New Zealand has excise duties for a range of products, including tobacco, alcohol, and petrol. For alcohol and tobacco, the excise duties are not directed to address the harms of these products, but is placed into a general fund allocated by the government of the day.

To ensure the recreational cannabis market in New Zealand meets the harm reduction objective, a portion of cannabis revenue should be allocated to this purpose. We recommend a harm reduction levy is included in retail cannabis, as previously described in section eight.

Table 9.4 Recreational cannabis revenue allocation – USA

State	Cannabis-Specific Taxes	General Taxes Applying to Cannabis	Earmarked Revenue
Alaska	\$50 per ounce on mature buds/flower; \$25 per ounce on immature, seedy, or failed bud/flower; \$15 per ounce for the remainder of the plant; \$1 per plant for clones Localities sometimes levy cannabis-specific taxes	Localities sometimes levy general sales on cannabis. Local general sales tax rates in Alaska range from 0-7.5%	Not earmarked
California	15% on retail sale price + \$9.25 per ounce of wholesale flowers; \$2.75 per ounce of wholesale leaves; \$1.29 per ounce of wholesale fresh plant; Local cannabis business tax (0-20% on gross receipts + \$0-\$25 per square foot of cultivation)	7.25% state sales tax; 0-2.5% local sales tax	Up to the first 4% to various state agencies for regulatory costs; Next \$10 million to state universities for oversight and research on impacts of implementation and regulation; Next \$3 million to Highway Patrol to establish protocols to determine whether a driver is driving while impaired by cannabis; Next \$10 million (gradually increasing to \$50 million by FY2023) to Community Reinvestment programs to support communities disproportionately affected by past federal and state drug policies; Next \$2 million to medical cannabis research. Of the remaining funds: 60% to youth education, prevention and treatment; 20% to prevent and clean up damage resulting from illegal growing of cannabis; 20% to state and local law enforcement
Colorado	15% on retail sale price + 15% on average market wholesale price (for non-arm's length transactions, weight sold is multiplied by a single statewide average price to determine tax base)	0-6.5% local sales tax†	First \$40 million from 15% tax on average market price to Public School Capital Construction Assistance Fund; Of 15% cannabis-specific sales tax: 90% to state government and 10% to local government; First \$30 million from state government share to State Public School Fund, next 28.15% to General Fund, remainder to Marijuana Tax Cash Fund
Massachusetts	10.75% on retail sale price; 0-3% local option	6.25% state sales tax	First, for implementation, administration, and enforcement; next, for public health, including substance misuse treatment and prevention, public safety, municipal police training, Prevention and Wellness Trust Fund, and programming to support communities disproportionately impacted by past drug policies
Nevada	10% on retail sale price + 15% on wholesale fair market value (weight sold is multiplied by a single statewide average price to determine tax base)	6.85% state sales tax; 0-1.25% local sales tax	Wholesale revenue first to cover state and local cost of regulation of the industry, remainder to state public education fund; Cannabis-specific sale price revenue to state's rainy-day fund
Oregon	17% on retail sale price; 0-3% local option	N/A. Oregon does not levy general sales taxes at the state or local level.	Tax program administration costs; Then 40% to Common School Fund, 20% for mental health, alcohol and drug services, 15% for state police, 10% to cities, 10% to counties, 5% for alcohol and drug services
Washington	37% on retail sale price	6.5% state sales tax; 0.5-3.1% local sales tax; 0.484% Business & Occupation (B&O) gross receipts tax	\$240,000 for program evaluation; \$1,250,000 to Liquor and Cannabis Board; Then, 15% to programs to prevent or reduce substance misuse among young people, 10% to cannabis education and public health programs, 0.6% to University of Washington and 0.4% to Washington State University to research short- and long-term impacts of cannabis use, 50% to state basic health plan trust account, 5% to health and dental care, 0.3% to building bridges programs, Remainder to the General Fund

Source: Institute on Taxation and Economic Policy, Taxing Cannabis January 2019.

Appendix F Balancing policy – market structure

Policy	Benefits	Risks	Recommendation
Quantity cap	Enables quota system and control over players in the market - Enables separate quota for firms that meet social equity objectives	Continued illicit market/Undersupply Oversupply Hoarding quota to prevent production Ongoing regulatory costs to manage quota allocation	Recommend quota set at sufficiently above expected consumption to ensure market functions Separate tier for enter
Licence cap -Including region caps	Limits number of market participants Restricts market share Incentivises establishment in rural areas	Difficult to manage supply levels Accumulation of licences to prevent sale Local monopolies and limited competition Ongoing need to reallocate licences	Not recommended -Quota system will limit participants at growing level
Micro-licencing	Low barrier to entry for small operation Improved equity of access to industry Supports transfer of illegal operations to legal market	Regulation of smaller firms Used to avoid quota system Oversupply	Recommended at a maximum of 200 plants per grower
Vertical integration restriction at all levels	Prevents larger firms dominating market Easier for micro businesses	Smaller firms less competitive Investment in industry less attractive Reduced economies of scale - higher retail prices High regulation cost	Not recommended
Partial vertical integration	Economies of scale Cost reduction	Small number of grower-manufacturers controlling market	Not recommended
Unrestricted vertical integration	Economies of scale Cost reduction Allows quota to limit market share Smaller businesses able to differentiate	Small number of companies dominating market	Recommended
Horizontal integration restriction	Limits market share Prevents market being dominated by few participants	Limits economies of scale and competition	Not recommended -Limited at grower level by quota -Vertical integration will limit horizontal integration at processing and retail
Import/export restriction	Seed to sale monitoring Quality control WTO obligations	WTO obligations Undersupply/overproduction	Recommend cannabis can be imported/exported with other legal jurisdictions provided the importer/exporter has a growing licence Consistent with medicinal policy
Restrict International ownership	Support NZ development	WTO obligations	Not recommended - Quota system for prioritising certain groups, international ownership open for remainder

Appendix G Balancing policy – licensing

Policy	Benefits	Risks	Recommendation
Collect fees at each point in supply chain	Collects for the actual output of each point in chain	High regulatory costs	Recommended Regulatory cost likely incurred as part of seed-to-store management
Collect fees from growers only	Single point of collection	Some will be unsold downstream	Not recommended
Collect fees from processors only	Single point of collection Likely the fewest number of parties collecting	Some will be unsold at retail level	Not recommended
Collect fees from retailers only	Single point of collection	Likely most number of organisations increased compliance and regulatory costs	Not recommended
Quota tradability	Improved supply efficiency	Agglomeration Conflict with allocation principles	Classes of quota tradability based on quota tier held
Differential licencing cost	Support rural and regional stores	"Subsidising cannabis stores"	Recommended
Two-phase licencing	Pre-gauge market size and shape		Have EOI process prior to allocation of licences