

Interim Regulatory Impact Statement: Improving our GMO regulations for laboratory and biomedical research

Coversheet

Purpose of Document	
Decision sought:	Analysis produced for the purpose of informing: the release of a discussion document.
Advising agencies:	Ministry for the Environment
Proposing Ministers:	Minister for the Environment (Hon David Parker)
Date finalised:	10/3/2023
Problem Definition	
<p>New Zealand's regulatory framework for genetically modified organisms (GMOs) is unnecessarily restrictive to a degree not commensurate with the level of risk, holding back research and innovation that would provide benefits to New Zealanders.</p> <p>In the years since this regulatory framework was last reviewed in 2003, biotechnology has advanced significantly and the risks of its use are now much better understood, but the settings for research using GMOs in New Zealand have neither kept pace with these developments nor evolved due to our increased understanding.</p> <p>This impact statement analyses 10 proposals to improve the regulatory requirements for laboratory research and biomedical research & development that use GMOs. These proposals aim to more proportionately manage the risks of this research, decreasing unnecessary administrative requirements and increasing time and funding available for research, with the ultimate aim of increasing research and health outcomes of benefit to New Zealand and New Zealanders.</p>	
Executive Summary	
<p>Genetic modification and genetically modified organisms (GMOs) are primarily regulated in New Zealand under the Hazardous Substances and New Organisms Act 1996 (HSNO Act), its regulations, and related standards. These aim to ensure that the environment, and the health and safety of people and communities, are protected by preventing or managing the adverse effects of hazardous substances and new organisms (which includes GMOs).</p> <p>While GMOs need to be managed well due to the potential risk they may pose to people and the environment, they can and have benefitted New Zealand's communities, the environment, and the economy. Genetic modification is used in numerous fields including medicine, horticulture, agriculture, food production, and industrial manufacturing. Applications of genetic modification can range from gene therapies to treat diseases, the development of plants resistant to pest species, and the production of useful enzymes, hormones, and vaccines.</p> <p>Regular feedback from stakeholders across a variety of sectors has highlighted the need to review and update New Zealand's legislation and regulations for GMOs. Having been</p>	

cautiously set over 20 years ago when genetic modification was little understood, the overly stringent regulatory settings for GMOs are likely to be holding back research and innovation that would benefit New Zealand and New Zealanders, without commensurately reducing risks to the environment and the health and safety of people and communities.

A continuation of the current regulatory requirements will likely result in counterfactual lost opportunities, be they to research, employment, medical applications, funding, and ultimately health and economic benefits for New Zealand.

How was this work initiated?

In response to reports by the Royal Society Te Apārangi and the Prime Minister's Chief Science Advisor on New Zealand's GMO regulations, in May 2021 the Minister for the Environment requested that the Ministry for the Environment (MfE) provide advice on options for reducing any unnecessary regulatory restrictions on human biomedical R&D using GMOs. Following feedback from the Office of the Prime Minister's Chief Science Advisor, the scope of this policy work was widened beyond just human biomedical R&D to ensure future regulations were workable and delivered the best health and research outcomes possible.

How were issues identified?

At the direction of the Minister for the Environment, in November 2021 MfE also engaged with stakeholders conducting research in New Zealand using GMOs to understand their experience of working with the current regulatory framework. Based on this engagement and further analysis by MfE, the issues identified with the regulatory framework broadly covered the:

- overly stringent requirements for very low risk and lab-dependent GMOs
- over regulation of gene editing technologies (based on their mechanisms of action)
- application, amendment and approval requirements (including for medicines/therapies)
- administrative requirements for laboratory research (especially record-keeping)
- import, export, and transfer/movement requirements
- lack of clarity of the regulatory status of certain biotechnologies
- assessments and approvals for low-risk fermentation
- need for the regulatory framework to be future proof.

Objectives

In developing policy options to address the issues identified, the objectives guiding this policy work were to ensure that New Zealand's regulatory framework for GMOs:

- proportionately manages the risks that laboratory research poses to the environment and health and safety of people and communities¹
- contributes to better health outcomes for New Zealanders through greater biomedical research outcomes and innovation, and greater access to therapies and medicines
- is not only up to date but also future proof, to anticipate and flexibly accommodate, to the best extent possible, future technological developments.

¹ Including the health and safety of laboratory staff.

Proposals

This impact statement analyses 10 proposals with options to improve New Zealand's GMO regulatory framework for laboratory research and biomedical research & development. These proposals cover:

1. Assessment and approval requirements for laboratory research
2. Assessment and approval requirements for medicines that are or contain new organisms (which includes GMOs)
3. Record-keeping requirements
4. Audit frequency (of containment facilities)
5. Movements of organisms between laboratories
6. Regulatory requirements for the use of eukaryotic somatic cells
7. Regulatory status of certain biotechnologies
8. Low-risk fermentation
9. Standards for containment facilities
10. Reviews of regulatory settings.

Why is government intervention required?

The majority of the issues cited by respondents to MfE's engagement with the New Zealand research community were issues that could only be addressed at the primary or secondary legislation level or through changes to standards. As such, the majority of the options for these proposals cover changes to primary legislation, secondary legislation and standards, all of which can only be achieved through government intervention.

Limitations and Constraints on Analysis

One limitation of the analysis for this policy work is that the evidence base used to support the need for policy changes and to establish issues/issue areas consists primarily of the viewpoints of researchers, organisations, companies, and government agencies. However, these individuals and groups have a high level of relevant expertise and are respected in this area. These individuals and groups include the Office of the Prime Minister's Chief Science Advisor, Crown Research Institutes (CRIs), professors and lead researchers at New Zealand's largest universities, the Royal Society Te Apārangi, and the Productivity Commission.

While the absence of evidence that the HSNO Act is holding back research and biomedical therapies may point to there being no problem with the regulatory settings, it may also be the case that the regulatory settings are holding back research and biomedical therapies but not in a way that would provide tangible evidence. Relatedly, this constrains the ability to establish the likely benefits that would result from policy changes. This is especially the case with research that would have occurred were it not for the stringency of the current regulatory requirements.

Despite these limitations and constraints, in MfE's view the viewpoints expressed by numerous respected individuals and groups point to the need to review and update the New Zealand's regulatory framework for GMOs. MfE is also confident that our previous engagement with the New Zealand research community has highlighted those issues that are of most significance (according to the narrow scope of this review), and that a public

consultation process will provide additional evidence on issues, their significance, and what options may best benefit New Zealand and New Zealanders.

Responsible Manager(s) (completed by relevant manager)

Sarah Kenward

Manager, Hazardous Substances and Biotechnology Policy

10/3/2023

Quality Assurance (completed by QA panel)

Reviewing Agency: Ministry for the Environment

Panel Assessment & Comment: A quality assurance panel with members from the Ministry for the Environment has reviewed the Interim Regulatory Impact Statement. The panel considers that it **meets** the Quality Assurance criteria.

The Interim Regulatory Impact Statement clearly sets out the context for the issues that it analyses and shows adequate consultation with affected parties. Furthermore, the Interim Regulatory Impact Statement contains a clear analysis of the options relative to the selected objectives. The quality assurance panel found the impact and cost-benefit analyses to be comprehensive. Overall, the quality assurance panel considers that the information and analysis in the Interim Regulatory Impact Statement meets the criteria necessary for Ministers to make informed decisions.

Section 1: Diagnosing the policy problem

What is the context behind the policy problem and how is the status quo expected to develop?

Genetic technologies and the means of genetically modifying organisms have advanced significantly over the last two decades. In the early 2000s, genetic modification was new and not well understood, and genetic modification and genetically modified foods were considered a controversial issue of high public interest. As a result, the regulations for genetic modification adopted by New Zealand and a number of other jurisdictions were guided by the precautionary principle, to limit risk from a technology that was at that time not well understood.² In New Zealand, the Royal Commission on Genetic Modification's recommendation for the regulation of genetic modification in 2001 was to preserve opportunities while proceeding selectively with appropriate care.

When the GMO provisions of the HSNO Act were last reviewed in 2003, genetic modification mainly consisted of the addition of foreign DNA to a host organism (commonly referred to as

² The Precautionary Principle is a default caution setting for decision-makers when, for example, scientific evidence about an environmental or human health hazard is limited or uncertain, and where the stakes are high. Typically, the setting would be revised over time as more data and knowledge becomes available.

transgenic technology). While transgenic technology is still commonly employed in genetic modification research, advances such as gene editing have widened the scope of what is possible and biotechnology will continue to rapidly advance, as it has over the last 20 years.³ As a class of tools, gene editing has greatly reduced the cost and time required to modify genes when compared to existing genetic modification techniques. Likewise, the cost of genetic sequencing and DNA synthesis will likely continue to rapidly reduce in price. Advances in artificial intelligence tools for biology, notably DeepMind's AlphaFold, will (and has) greatly reduced the time required for research in areas like protein engineering and biomedical therapy development.

New Zealand also faces several important issues that have grown in importance in the last 20 years, including climate change, biodiversity loss and creating resilient food systems. As a set of tools, biotechnology may play a role in New Zealand's response to these issues. As an example, biotechnology tools are being developed to lower greenhouse emissions from agricultural production, increase the resilience of native species to pests and diseases, and improve the resiliency of crops to drought.

Reduction in the cost, effort and time required for biotechnology research & development will increase the number and range of tools and types of biotechnology techniques developed, further testing the regulatory settings of the HSNO Act. Increases in the number of biotechnology tools developed, combined with increasing costs from issues like climate change, will also increase the opportunity cost of failing to capture the benefits that these new tools bring.

Legislation and regulations

GMOs are primarily regulated in New Zealand by the HSNO Act. The purpose of the HSNO Act is to: *'...protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and new organisms'* (section 4). The prevention and management of adverse effects from new organisms is carried out through the risk assessment and risk management function of the Environmental Protection Authority (EPA).

Under the HSNO Act, the definition of new organisms includes genetically modified organisms. As such, provisions for GMOs are generally included under those for new organisms, unless otherwise specified (such as under sections 42, 42A and 42B). These provisions cover the importation, development, field trial, conditional release and full release of new organisms/GMOs. Through these provisions, the EPA can assess applications for new organisms/GMOs and approve these applications with or without specific controls.

When assessing applications for new organisms/GMOs, the HSNO Act sets out a number of standards and considerations that the EPA must abide by. For instance, section 36 of the HSNO Act sets out minimum standards which must be considered by the EPA when assessing applications to release a new organism. Specifically, if the new organism is likely to cause any of the following, the EPA must decline the new organisms application:

³ Gene editing is a type of genetic modification in which DNA is inserted, deleted, modified or replaced in an organism's genetic sequence (ie, in an organism's genome). Unlike early genetic modification techniques that randomly insert genetic material into a host genome, gene editing targets site-specific locations in an organism's genome.

- cause any significant displacement of any native species within its natural habitat
- cause any significant deterioration of natural habitats
- cause any significant adverse effects on human health and safety
- cause any significant adverse effect to New Zealand's inherent genetic diversity
- cause disease, be parasitic, or become a vector for human, animal, or plant disease, unless the purpose of that importation or release is to import or release an organism to cause disease, be a parasite, or a vector for disease.

For applications to import new organisms into containment or develop new organisms in containment, the EPA also carries out assessments of the adverse effects of the particular importation or development.

MPI is the government agency tasked with compliance monitoring and enforcement for containment facilities approved under the HSNO Act. In addition, MPI is the government agency that assesses and approves biological imports into and exports from New Zealand, including the import and export of genetically modified organisms. The purpose of the biosecurity system, encompassing the Biosecurity Act 1993 and the operational processes/standards implemented by MPI, is *'to prevent or manage risks from harmful organisms, like pests and diseases.'* It does this by *'stopping pests and diseases before they arrive'* and *'dealing with any if they do enter the country'*. Minor consequential amendments may be required to aspects of the Biosecurity Act 1993 to effectively implement any policy changes agreed to by Cabinet as part of this policy work.

There is currently no related policy work underway or planned for the HSNO Act. However, a review of the Biosecurity Act is currently being undertaken by MPI. Several aspects of this review may touch on the areas related to this policy work, in particular those relating to the importation of organisms. The next stage for this review will be a public consultation on potential changes to the Biosecurity Act (only), likely in the first half of 2023. The scope of the changes to be consulted on is limited to the Biosecurity Act's primary legislation.

Additionally, the Therapeutic Products Bill, which will replace the Medicines Act 1981, has recently been introduced to Parliament. This is expected to progress through the House by the end of 2023 and is expected to come into force in a few years to allow the development of necessary secondary legislation.

What is the policy problem or opportunity?

The settings and requirements under New Zealand's regulatory framework for genetically modified organisms are likely to be unnecessarily stringent, without commensurately reducing risks to the environment and the health and safety of people and communities. The stringency of these settings are likely to be holding back research and innovation that would benefit New Zealand and New Zealanders. New Zealand's regulatory framework is regarded as one of the strictest in the OECD and, having not been updated since 2003, its settings have not kept pace with developments in biotechnology and our additional understanding of its risks over the last 20 years.⁴

⁴ Library of Congress: Law Library (2014). *Restrictions on Genetically Modified Organisms: New Zealand*. Available at: <https://web.archive.org/web/20210206072656/https://www.loc.gov/law/help/restrictions-on-gmos/new-zealand.php> and Library of Congress: Law Library (2014). *Restrictions on Genetically Modified Organisms: European Union*. Available at: <https://web.archive.org/web/20210111062552/https://www.loc.gov/law/help/restrictions-on-gmos/eu.php>

While the Royal Commission for Genetic Modification was clear in its 2001 report that it endorsed the then settings of the legislative and regulatory frameworks as appropriate for the technology of the time, it recognised that a medium and long-term strategy was needed to ensure that the settings remained appropriate for New Zealand, and the people of New Zealand, as technology and the wider context evolved.

It is generally understood that the default caution setting that is adopted based on a precautionary principle, like the setting adopted under the HSNO Act in 2003, be revised over time as more data and evidence on the risks of a technology becomes available. Since 2003, large national and international organisations have assessed the evidence on the environmental and health safety of GMOs, concluding that, to date, plants and foods produced through biotechnology are no more risky than those produced through conventional means.⁵

Of particular note, a large review released by the European Commission in 2010 observed that the “main conclusion to be drawn from the efforts of more than 130 research projects, covering a period of more than 25 years of research, and involving more than 500 independent research groups, is that biotechnology, and in particular GMOs, are not *per se* more risky than e.g. conventional plant breeding technologies.”⁶

In contrast to New Zealand, other international jurisdictions, such as Canada, Australia and the United States, have updated their regulations over time to less stringently regulate GMOs and new gene editing techniques.⁷ Additionally, of particular note, the United Kingdom and the European Union are both moving to less stringently regulate new gene editing techniques under their respective regulations.

The *Government Expectations for Good Regulatory Practice* also makes clear the government’s expectations of regulatory agencies to ensure that regulatory systems are an asset for New Zealanders, not a liability.⁸ It is recognised that while regulation can protect the wide-ranging rights and interests of New Zealanders, it can also ‘impose costs, limit freedoms, stifle innovation, and give rise to other unintended consequences.’ To achieve the right balance, it is expected that regulatory agencies review regulatory systems at appropriate intervals to determine whether they are still fit-for-purpose, and that regulatory systems achieve their objectives in a ‘least cost way’. Given the accumulated understanding of the risks of GMOs, it is unlikely that the current regulatory system for GMOs is achieving its objectives in a least cost way.

Research and stakeholder views in favour of changes to regulatory settings

⁵ These organisations include the World Health Organisation (WHO), Food Standards Australia New Zealand (FSANZ), the American Medical Association, the National Academies of Sciences, Engineering, and Medicine (United States) and the European Commission.

⁶ European Commission. (2010). A Decade of EU-Funded GMO Research 2001–2010. *Directorate-General for Research and Innovation, Biotechnologies, Agriculture, Food*.

⁷ New Zealand Productivity Commission (2021). *New Zealand firms: Reaching for the frontier. Final report*. p. 179. Available at: www.productivity.govt.nz/inquiries/frontier-firms/

⁸ For more information on the Government Expectations for Good Regulatory Practice, please see: <https://www.treasury.govt.nz/publications/guide/government-expectations-good-regulatory-practice>

Specific to the New Zealand context, research conducted and views expressed by the groups and companies in the New Zealand biotechnology industry support the view that the settings of our GMO regulatory framework is unduly stringent and stifling innovation.

In 2012, Rhadegund Life Sciences, on behalf of MfE, produced a report on the factors that influence New Zealand businesses' decisions to innovate with new organisms (which include genetically modified organisms).⁹ The conclusion of this report was that “the main factors significantly constraining innovation using new organisms are ‘Regulations’ and ‘Costs to develop or introduce a new organism’” and that when “compared with the survey of all businesses, development costs and regulations are viewed as considerably greater constraints for firms using new organisms”. The research also noted that “some firms are considering going offshore to use new organisms to avoid regulatory costs and, in the case of genetically modified organisms, conflicts over their use”. In the years since this research was conducted, former New Zealand companies Lanzatech and New Culture have relocated overseas citing the stringency of New Zealand’s GMO regulations.

Similarly, in 2012 the Royal Society Te Apārangi consulted its Members, Fellows, and Constituent Organisations on the experiences of working in fields requiring regulatory oversight of the HSNO Act.¹⁰ The Royal Society’s report on this consultation found consensus for the reduction of administrative overheads and reduction of the regulation of low-risk organisms.

In 2015, Rhadegund Life Sciences was commissioned by Callaghan Innovation to establish what impact the New Organism provisions of the HSNO Act may have on New Zealand business.¹¹ The authors of this report concluded that:

New Zealand has a wide range of opportunities to increase the productivity and value of its agricultural sector and build a sustainable green manufacturing sector by innovation with new organisms. These opportunities are currently limited by New Zealand’s HSNO regulations.

In 2016, the Royal Society initiated a programme of work to explore the implications of gene editing technology for New Zealand. In its concluding comments following the release of its four reports, the Royal Society’s panel identified a number of issues with New Zealand’s legal and regulatory framework. These included that the current framework is “becoming increasingly out of date given the advances in gene-editing technology” and that the panel would like to see “a legal and regulatory system that is more future-focused and ‘fit-for-purpose’”.¹²

⁹ Rhadegund Life Sciences (2012). Factors Influencing Decisions to Innovate with New Organisms. Available at: <https://environment.govt.nz/publications/factors-influencing-decisions-to-innovate-with-new-organisms/>

¹⁰ Royal Society Te Apārangi (2012). *The Impact of the Hazardous Substances and New Organisms (HSNO) Act on Research in New Zealand*. Available at: <https://www.royalsociety.org.nz/assets/documents/RSNZ-HSNO-consultation-paper.pdf>

¹¹ Rhadegund Life Sciences (2015). *The Impact of the New Organism Provisions of the HSNO (1996) Act on New Zealand Business*.

¹² Royal Society Te Apārangi (2019). *Gene editing: Reflections from the panel co-chairs*. Available at: <https://www.royalsociety.org.nz/major-issues-and-projects/gene-editing-in-aotearoa/gene-editing-reflections-from-the-panel-co-chairs/>

In a briefing to the Prime Minister in response to the Royal Society's reports on gene editing, the Prime Minister's Chief Science Advisor noted that she agreed with the panel's finding that the current legal and regulatory framework for GMOs is not fit for purpose.¹³

BioTech New Zealand, an organisation representing the New Zealand's biotechnology sector, in 2020 released a report on the wider New Zealand biotechnology sector.¹⁴ A survey carried out for the report on the opportunities and challenges of the NZ biotechnology sector found that the current GMO regulations were considered by those companies surveyed to be the second most significant constraint on biotechnology R&D and the third most significant constraint to biotechnology commercialisation in New Zealand.

In April 2021, the Productivity Commission released a report on New Zealand's frontier firms, defined as the most productive firms in the domestic economy within their industry.¹⁵ The purpose of this report was to "identify policies and interventions that could maximise the performance and contribution to the economy of New Zealand's frontier firms". In its findings on New Zealand's GMO regulations, it concluded that New Zealand's approach to regulating genetic modification techniques does not reflect technological advances since it was last reviewed in 2001. One submitter to the Productivity Commission's inquiry, New Zealanders for Health Research, said that New Zealand's GMO regulations are also a handbrake on health research. Responding to its finding, the Productivity Commission recommended that "the Government should undertake a full review of the regulation of genetic modification (GM), to ensure it is fit for purpose and supports domestic innovation".

CRIs such as AgResearch and Scion have also highlighted issues in the current legislation that in their view are holding back research in the field. As an example, due to the constraints of our GMO legislation, in 2017 AgResearch decided to conduct field trials on genetically modified High Metabolisable Energy (HME) ryegrass overseas rather than in New Zealand. Representatives of Scion have commented that current legislation would place significant constraints on potential future field trials of pines gene edited to be sterile.¹⁶ Due to New Zealand's unique environment and weather conditions, field trials are of particular importance to New Zealand biotechnology research.

In July 2019, the Government's Interim Climate Change Committee (the Committee) released its report, *Action on agricultural emissions*. In their report, the Committee raised concerns that New Zealand's current GMO legislation could be a barrier to lowering agricultural emissions. There have been a growing number of calls in recent years to investigate and utilise genetic modification to address these issues. In an open letter in 2019, 150 young scientists urged the Green Party to take a lead in changing New Zealand's GMO legislation, arguing that "climate

¹³ Office of the Prime Minister's Chief Science Advisor. <https://www.pmcsa.ac.nz/topics/gene-editing/>

¹⁴ BioTech New Zealand (2020). Aotearoa New Zealand Boosted by Biotech. Available at: https://biotechnz.org.nz/wp-content/uploads/sites/16/2020/11/Biotech-Report-2020_online.pdf

¹⁵ New Zealand Productivity Commission (2021). *New Zealand firms: Reaching for the frontier. Final report*. Available at: www.productivity.govt.nz/inquiries/frontier-firms/

¹⁶ Sterile pines would reduce future wilding events and potentially increase growth rates by diverting energy from reproduction to wood growth.

change is one of the greatest crises in human history, and our current law severely restricts the development of technologies that could make a vital difference.”¹⁷

Views of the New Zealand biotechnology research community

Following the direction of the Minister for the Environment, in October 2021 MfE reached out to universities, research institutes, and biotechnology companies in New Zealand that were likely to be conducting research using GMOs. The purpose of this engagement was to establish how these groups experienced working with the current GMO regulations and to identify any issues with those regulations, especially those affecting biomedical R&D. Twenty-four responses were received representing the views of over 32 individual researchers or laboratory managers from 11 universities, research institutes and biotechnology companies.

The main issues of the GMO regulations cited by respondents were:

- the level of regulatory restrictions on mammalian cells, laboratory-dependent organisms, and low-risk organisms – due to the very low or essentially non-existent risk of these organisms to the health and safety of people and communities
- the regulation/level of regulation on certain technologies like gene editing, SDN-1, plasmids and replicant-deficient viral vectors
- the process for HSNO approvals, amendments to HSNO approvals, imports, exports and transfers
- the record-keeping, tracking and audit/inspection requirements for containment facilities.

While the researchers represent only a fraction of the total number of researchers in this area, the views expressed by the researchers and laboratory managers surveyed were consistent. The views expressed on certain topics also highlighted what appear to be, in MfE’s view, unnecessarily stringent regulatory requirements (especially those concerning very-low risk organisms like mammalian cells).

In response to MfE’s summary of the community’s feedback, the Prime Minister’s Chief Science Advisor stated that the “...Office of the Prime Minister’s Chief Science Advisor strongly supports the intent to remove unnecessary barriers to research imposed by regulation and endorses the comprehensive research carried out by the Ministry to identify the barriers to biomedical research.” Similarly, the EPA’s response to the NZ biotech communities feedback was that they agreed “that in many, if not all, cases discussed in this briefing note that research using genetic modification technologies could benefit from a lighter regulatory approach.”

Stakeholders not in favour of changes to regulatory settings

In contrast to New Zealand’s biotechnology industry, researchers and research organisations, a number of organisations, local government bodies and individuals are supportive of New Zealand’s strict GMO legislation. These groups include GE Free New Zealand, the Sustainability Council, and the McGuinness Institute. These organisations are opposed to

¹⁷ The Spinoff. (October 2019). GM could be decisive: An open letter to the Green Party from young NZ scientists. Retrieved from <https://thespinoff.co.nz/science/29-10-2019/genetic-modification-open-letter-green-party-young-scientists/>

regulatory change that would more lightly regulate GMOs as it is their view that GMOs must be strictly regulated to reduce any risks to human health and New Zealand's environment and economy.

In particular, the Sustainability Council is opposed to changes to New Zealand's GMO legislation as they view this as a risk to New Zealand's export revenues.¹⁸ In their view, New Zealand exporters benefit from the country's current 'GM free' (genetically modified free) status.

GE Free New Zealand advocate for stricter labelling requirements for genetically modified food, a moratorium on genetic modification in New Zealand and restrictions on genetic modification releases at a regional council level. In addition, in their view GMOs pose a risk to human health and the environment.

The McGuinness Institute has proposed a moratorium on any GMO releases and a systemic review of New Zealand's GMO legislation. Their recommended changes to our GMO legislation would further restrict the development, field testing and release of GMOs in New Zealand.

Since 2015, a number of local authorities have introduced district or regional by-laws prohibiting or limiting the release and/or field trials of GMOs, excluding medical therapies. These authorities include the Hastings District Council, Auckland Council, Whangarei District Council, Far North District Council, and Northland Regional Council. In the view of these local authorities, these district and regional by-laws are required to protect the environment and people from the adverse effects of GMOs.

New Zealand organic growers have also expressed opposition to the release of GMOs in New Zealand and have supported regional and district by-laws restricting GMO release. A number of submissions on the Organic Products Bill in particular requested that the Organic Products Bill specifically prohibit the use of GMOs in organic production. Submitters who opposed the use of GMOs in organic production included Organic Farm New Zealand, the Soil and Health Association, Biodynamics New Zealand, and GE Free New Zealand.

Māori views on GMOs

A significant amount of academic research has been conducted on Māori views of genetic modification. This research has shown that there is no one 'Māori view', any more than there is one 'Pakeha view' or 'Pasifika view'. A range of views are held by Māori, ranging from acceptance of genetic modification to rejection.

In particular, the views expressed by Māori are often nuanced and take into account a range of considerations and concepts. Tikanga Māori concepts such as *kaitiakitanga* (guardianship), *manaakitanga* (caring or support, an imperative to help those who are sick for instance), *kaupapa* (purpose, of research for instance), *whakapapa* (genealogy) and *mauri* (life essence) allow for both ethical and practical considerations relevant to the use of genetic modification.

We don't consider there will be any distributional impacts on certain population groups, including hapū, iwi and Māori, from the policy changes that will be proposed. However, MfE

¹⁸ Sustainability Council of New Zealand. (January 2021). GM Free Food Producer. Retrieved from <http://www.sustainabilitynz.org/genetic-modification/gm-free-food-producer/>

will specifically consult hapū, iwi and Māori to ensure their views on matters that may potentially impact them are heard.

Because the purpose of this review is to improve the regulations to make conducting research easier for researchers, in order to improve research and health outcomes for New Zealanders, MfE did not consider it appropriate for any particular group, including Māori, to be involved in the development of policy options prior to MfE's consultation with researchers (during the public consultation period). However, because there are aspects to the proposals that relate to taonga species, genetic material from taonga species and Māori, and cells and tissues of Māori, MfE will specifically consult on those aspects with hapū, iwi and Māori, additional to consulting with hapū, iwi and Māori on the proposals in general.

In addition, because MfE considers that the Crown should not be telling hapū, iwi and Māori what the appropriate regulation of taonga species and cells and tissues of Māori should be, the consultation on these aspects will not present a limited list of possible options to Māori. Instead, it will ask hapū, iwi and Māori what regulatory requirements/restrictions they would consider appropriate.

MfE, in collaboration with the EPA, will also be consulting on the details of a risk-tiering framework (should a risk-tiering framework be implemented) after any bill on primary legislation changes is passed. This will allow feedback received from hapū, iwi and Māori during the initial consultation to be incorporated into the details of a risk-tiering framework, and for further consultation with hapū, iwi and Māori to occur.

Research and surveys on public opinions

Research carried out in 2022 by Kathlene, Munshi, Kurian and Morrison surveyed 500 Māori and non-Māori on their perspectives on genetic modification and gene editing. On perspectives of genetic modification and gene editing, they found that for Māori: 11% were strongly supportive, 33% leaned supportive and 13% strongly opposed. While for non-Māori: 12% were strongly supportive, 23% leaned supportive and 8% were opposed.¹⁹

The research carried out by Kathlene, Munshi, Kurian and Morrison also showed that, generally, New Zealanders are more supportive of the use of genetic modification and gene editing in healthcare and conservation scenarios compared to food production and farming scenarios.

What objectives are sought in relation to the policy problem?

The objectives of this policy work are to ensure that New Zealand's regulatory framework for genetically modified organisms:

- proportionately manages the risks that laboratory research poses to the environment and health and safety of people and communities²⁰
- contributes to better health outcomes for New Zealanders through greater biomedical research outcomes and innovation, and greater access to therapies and medicines

¹⁹ Kathlene, L., Munshi, D., Kurian, P., & Morrison, S. L. (2022). Cultures in the laboratory: mapping similarities and differences between Māori and non-Māori in engaging with gene-editing technologies in Aotearoa, New Zealand. *Humanities and Social Sciences Communications*, 9(1), 1-10.

²⁰ Including the health and safety of laboratory staff.

- is not only up to date but also future proof, to anticipate and flexibly accommodate, to the best extent possible, future technological developments.

Necessity of Government action

The majority of the issues cited by respondents to MfE's engagement with the New Zealand research community were issues that could only be addressed at the primary or secondary legislation level or through changes to standards. As such, the majority of the options for these proposals cover changes to primary legislation, secondary legislation and standards, all of which can only be achieved through government intervention.

Likely outcomes without intervention

A continuation of the current regulatory requirements would likely result in counterfactual lost opportunities, be they to research, employment, medical applications, funding, and ultimately health and economic benefits for New Zealand. These lost opportunities could occur in several ways. Current financial and administrative resources to meet regulatory requirements would result in less funding that could be put towards additional research (research effects). Lower funding would also lower the number of research positions available in New Zealand for researchers (employment effects).

From our engagement, respondents noted that researchers will tend to make decisions based on what would be easiest under current regulatory restrictions rather than what would be best for their research (research effects). The regulatory restrictions on biomedical research also affect the willingness of researchers to pursue the development of medical applications (one research said the process to gain final approval seemed like a "torturous process") and if they do, the regulatory restrictions would affect the time to develop those medical applications (economic and health effects).

Section 2: Deciding upon an option to address the policy problem

What criteria will be used to compare options to the status quo?

Proportionality – Will the policy be more proportionate or more proportionately regulate risks to the environment and the health and safety of people and communities?

Effectiveness – Will the policy option increase research outcomes and improve health outcomes for New Zealanders?

Future-proof – Will the policy option create a more up-to-date and/or future-proof regulatory framework for GMOs?

Efficiency – Is the policy option cost-effective and able to be implemented by users within a reasonable timeframe?

What scope will options be considered within?

1. A specific scope of work was requested by the Minister for the Environment (the Minister). The Minister requested that the scope focus on laboratory and biomedical research, and that the scope specifically not include changes to the provisions for field trials, conditional releases, and full releases (excluding the “release” of medicines that are, or contain, new organisms) under the HSNO Act.
2. Additionally, the Minister also requested advice from MfE on the inclusion of the regulatory provisions for heritable human cells and tissue within the scope of this policy work. MfE advised against the inclusions of the provisions for these cells, due to the ethical and regulatory complexity relating to their use in research.
3. While the scope of this work is generally limited to the regulatory requirements for GMOs, MfE has also been conscious that limiting the scope of options to just GMOs may create issues or unnecessary differential regulations. In these instances, the scope of proposed changes has been widened to include new organisms rather than just GMOs.²¹
4. As such, the scope of this policy work focuses on the regulations for laboratory research, approval for medical applications that are or contain new organisms, and ensuring that the regulations are up to date and future-proof more generally. This review is also focussed on low-risk research (ie, not involving pathogenic organisms), and unless specified, changes to the provisions for higher-risk organisms are not within scope. That is researchers surveyed by MfE specifically highlighted the disproportionate stringent regulations for very-low-risk and low-risk GMOs, but no issues were highlighted with the regulations for higher-risk research.
5. Due to the provisions for the environmental release of GMOs being out of scope of this review, several options have not been considered to address issues that have been identified. For example, while amending the definition of a ‘genetically modified organism’ to deregulate certain types of research (or certain types of genetic modification techniques) would lower the regulatory requirements for that research, it would also mean that conducting that research in the environment would not be prohibited.
6. While the scope of this policy review is narrow, changes to primary legislation, secondary legislation, and standards have been considered as part of this policy work. The regulatory requirements for GMOs are primarily contained within the Hazardous Substances and New Organisms Act 1996 (HSNO Act), related secondary legislation such as the Hazardous Substances and New Organisms (Organisms Not Genetically Modified) Regulations 1998, and standards that prescribe requirements for contained laboratory research.

What options are being considered?

Issue One – Assessment and approval of laboratory research

Status quo and issues

7. Under the current regulatory settings, the importation into or development of GMOs in containment requires approval from the EPA. These applications are either assessed under a full approval pathway or, if meeting the criteria for being “low-risk”, under a rapid

²¹ Under the HSNO Act, ‘genetically modified organisms’ are included under the definition of ‘new organisms’. New organisms includes GMOs as well as other organisms like zoo animals.

assessment pathway.²² Additionally, a number of existing importation approvals can also be used by individuals or groups who can meet the specific requirements of those importation approvals, such as being able to import those GMOs into a containment facility approved by MPI, operated according to a relevant standard at a required Physical Containment level.

8. In addition, the EPA has provided broad approvals to develop GMOs in containment (see paragraph 8 below) for three New Zealand universities, which are referred to as Institutional Low-Risk Approvals (ILRAs).²³ These broad approvals cover a large number of low-risk organisms, significantly reducing the number of applications that would have been required by these universities. Under current legislation, ILRAs cannot be issued by the EPA without an application being made.
9. Under current regulations, genetic modification research must be undertaken within laboratories that are approved by MPI as 'containment facilities'. These containment facilities must be operated according to specific standards relevant to the research being undertaken in those facilities. For instance, the MPI/EPA standard 154.03.02 covers facilities for microorganisms and cell cultures. These facilities must also be operated at a specific level of stringency based on the research being undertaken in those facilities, ranging from Physical Containment Level 1 (the lowest stringency) to Physical Containment Level 4 (the highest stringency).
10. The preparation of applications for laboratory research requires time and effort (and by extension, funding) from researchers in the New Zealand research community. The time and effort taken to prepare these applications, additional to the time and effort that may be required to apply for approval from internal biological safety committees, reduces the time and effort available for the research in question and naturally results in delays to research.
11. While they have several important benefits, there are number of limitations to the low-risk rapid assessment provisions under the HSNO Act. The first is that the pre-assessment stage for a rapid assessment provision (the period when an application is being prepared by an applicant) can still be lengthy, running into weeks or months. Secondly, the current rapid assessment provisions do not allow research to be conducted in laboratories that are not approved as containment facilities by MPI.
12. While case-by-case assessment and approval by a regulator is appropriate for research that is not low risk, applications to undertake low-risk research that has previously been categorized as low risk – as under ILRAs – is likely to be unnecessary.
13. It is also highly likely that there is research which is of such low risk that a containment facility requirement may be unnecessarily stringent. Researchers survey by MfE noted that many low-risk organisms present essentially zero risk to the environment and the health and safety of people.
14. As researchers noted, these organisms are incredibly dependent on specific laboratory conditions (one researcher describing them as “cells on life support”). This dependence on specific laboratory conditions means that these organisms are unlikely to survive, let alone proliferate, in the environment.
15. In addition, many organisms, including human and animal cells, require stringent measures to ensure that contamination of the organism from the environment does not

²² The criteria for “low-risk” are set out under the *Hazardous Substances and New Organisms (Low-Risk Genetic Modification) Regulations 2003*.

²³ These universities are the University of Auckland, the University of Otago and Massey University.

occur. Stringent measures to ensure nothing inadvertently gets in can naturally be expected to significantly lower the likelihood of anything getting out.

Regulatory frameworks under other jurisdictions

16. Other international jurisdictions, most notably Australia, exempt certain research from needing to be assessed by a regulator by explicitly outlining what research is exempt and the specific requirements and controls for these types of research.
17. For example, Australia’s GMO regulations currently categorise research into risk tiers according to features such as host organism, vector, modification, and products of a modification. In addition, the conditions under which research is to be carried out, such as the type of laboratory required, is set out for each risk tier, both under the regulations and within guidelines published by Australia’s Office of the Gene Technology Regulator (OGTR). By explicitly setting out the qualifying features and the conditions required for each risk tier, the need for assessment and approval of low-risk research by the OGTR is removed.
18. Included under the Australian framework is a risk tier under which very low risk genetic modification research can be carried out in laboratories that are not certified by the OGTR. This is also the case under Canadian and United States legislation, which do not regulate very low risk genetic modification research or require licensed facilities to undertake this very low risk research.
19. MfE considers there is likely to be genetic modification research of a similar risk profile (no risk or very low risk) which could be safely conducted in laboratories not approved as containment facilities by MPI. The relevant biological characteristics of the organisms used in this very low risk research are likely to be:
 - that they are not normally pathogenic to humans, animal, plants and fungi
 - their low probability of survival in the environment if they are inadvertently released
 - their inability to escape into the environment.

Options

Option 1 – Establish a risk-tiering framework excepting certain low-risk research from a) containment facility requirements and b) EPA assessment and approval requirements:

20. This option would establish a risk-tiering framework modelled on the current Australian risk-tiering regulations. According to specific criteria, this would exempt certain low-risk research requiring EPA approval for importation and development. A key requirement of all risk tiers would be that any unapproved release of GMOs into the environment would be prohibited.
21. This framework would have risk-tiers with the following features:

Risk tier	Conditions and requirements
Risk tier 1	<p>Research meeting the criteria of this risk tier would be exempt from EPA assessment and approval, including approval for the “release” of medicines that meet the criteria of this risk tier.</p> <p>In addition, the laboratory in which the research is undertaken would not need to be a containment facility approved by MPI.</p>
Risk tier 2	<p>Research meeting the criteria of this risk tier would be exempt from EPA assessment and approval.</p>

	<p>The research would be required to be undertaken in an approved containment facility operated according to the relevant standard at Physical Containment Level 1 (PC1).</p> <p>It would also be a requirement that a biosafety committee must also have confirmed that a) the research meets the criteria for this risk-tier, b) the committee is satisfied the researcher can undertake the research, and c) the facility is appropriate for the research. A record of each assessment would be sent to the EPA annually and a short description of the research notified publicly.</p>
Risk tier 3	<p>Research meeting the criteria of this risk tier would be exempt from EPA assessment and approval.</p> <p>The research would be required to be undertaken in an approved containment facility operated according to the relevant standard at Physical Containment Level 2 (PC2).</p> <p>It would also be a requirement that a biosafety committee must also have confirmed that a) the research meets the criteria for this risk tier, b) the committee is satisfied the researcher can undertake the research, and c) the facility is appropriate for the research. A record of each assessment would be sent to the EPA annually and a short description of the research notified publicly.</p>

22. All other contained laboratory research that does not meet the criteria for risk tiers 1 to 3 would require assessment and approval by the EPA before being undertaken.
23. Exemption from EPA approval for use in/as medicines would also apply to organisms/modifications that meet the criteria of Risk tier 1. For example, if human cells were to be included under Risk tier 1, personalised cancer treatments using human cells (such as CAR T-cell therapies) would be exempt from EPA assessment and approval for “release”. These medicines would still require approval from Medsafe prior to their use on patients.
24. To ensure that assessments by internal biosafety committees were sufficient, these biosafety committees would be required to be accredited by the EPA and a proportion of the assessments carried out would be audited by the EPA each year. To gain accreditation, biosafety committees would be comprised of qualified members. For those organisations that do not wish to have their own accredited biosafety committee, an alternative pathway would be for their research proposals to be assessed by another accredited biosafety committee or a biosafety committee setup under the EPA.
25. This risk-tiering framework was modelled after the Australian risk-tiering framework for several reasons. A risk-tiering framework modelled on the Australian framework would:
 - allow an increase in the proportionality of regulatory requirements within the prescribed scope (ie, just for laboratory research)

- potentially foster greater collaboration between New Zealand and Australian researchers and research groups by removing complexity and uncertainty regarding regulatory requirements for Australian researchers²⁴
- ease the transition of researchers from one country to the other
- encourage biotechnology companies to expand from one country to another, bringing greater economic and employment opportunities to both New Zealand and Australia
- build upon other initiatives to build cooperation between New Zealand and Australia in science, research and innovation, including the 2017 Agreement on Science, Research and Innovation Cooperation, which aims to create an adaptive, substantive and comprehensive foundation for developing a trans-Tasman innovation ecosystem.

Option 2 - Establish a risk-tiering framework excepting certain low-risk research from EPA approval requirements:

26. Establish a risk-tiering framework that exempts certain low-risk research from EPA assessment and approval requirements if conducted within containment facility and if assessed by a biosafety committee. As under option 1, a key requirement of all risk tiers would be that any unapproved release of GMOs into the environment would be prohibited.

27. This framework would have risk tiers with the following features:

Risk tier	Conditions and requirements
Risk tier 1	<p>Research meeting the criteria of this risk tier would be exempt from EPA assessment and approval.</p> <p>The research would be required to be undertaken in an approved containment facility operated according to the relevant standard at Physical Containment Level 1 (PC1).</p> <p>It would also be a requirement that a biosafety committee must also have confirmed that a) the research meets the criteria for this risk-tier, b) the committee is satisfied the researcher can undertake the research, and c) the facility is appropriate for the research. A record of each assessment would be sent to the EPA annually and a short description of the research notified publicly.</p>
Risk tier 2	<p>Research meeting the criteria of this risk tier would be exempt from EPA assessment and approval.</p> <p>The research would be required to be undertaken in an approved containment facility operated according to the relevant standard at Physical Containment Level 2 (PC2).</p> <p>It would also be a requirement that a biosafety committee must also have confirmed that a) the research meets the criteria for this risk tier, b) the committee is satisfied the researcher can</p>

²⁴ More than 30% of New Zealand's research community already have links with Australian counterparts, in areas such as agriculture, biotechnology and environmental research. This relationship is growing, with collaborative arrangements between governments, crown research agencies, and tertiary institutions, as well for individual researchers.

	undertake the research, and c) the facility is appropriate for the research. A record of each assessment would be sent to the EPA annually and a short description of the research notified publicly.
--	---

- 28. All other contained laboratory research that does not meet the criteria for risk tiers 1 to 2 would require assessment and approval by the EPA before being undertaken.
- 29. As under option 1, to ensure that assessments by internal biosafety committees were sufficient, these biosafety committees would be required to be accredited by the EPA and a proportion of the assessments carried out would be audited by the EPA each year. To gain accreditation, biosafety committees would be comprised of qualified members. For those organisations that do not wish to have their own accredited biosafety committee, an alternative pathway would be for their research proposals to be assessed by another accredited biosafety committee or a biosafety committee setup under the EPA.

Option 3 – Amend the Low-Risk Genetic Modifications:

- 30. This option would amend the low-risk genetic modifications regulations, that are set out under the Hazardous Substances and New Organisms (Low-Risk Genetic Modification) Regulations 2003, to allow certain low-risk genetic modifications to be undertaken in laboratories that are not approved as containment facilities.
- 31. This would be achieved by modifying the *Categories of low-risk genetic modification* under the Low-Risk Genetic Modifications Regulations from two categories to three. Like the risk-tiering framework under option 1, the containment requirements would be as follows:

Category	Containment requirement
Category A	Only requirement is that they are contained in a facility, but this facility is not required to be an MPI-approved containment facility.
Category B	Containment facility operated at a minimum of PC1 required.
Category C	Containment facility operated at a minimum of PC2 required.

- 32. As a consequence of increasing the number of *Categories of low-risk genetic modification*, the number of *Categories of host organisms* will also likely need to be increased to maintain compatibility between the two categories.

Option 4 – Status quo:

- 33. As outlined in the current situation above, under this option assessment and approval from the EPA would be required to carry out contained laboratory research (within an MPI-approved containment facility). Rapid assessment of low-risk research would be available for research that meets the criteria of the Low-Risk Genetic Modification Regulations.

Options not considered appropriate or workable:

Amending the definition of ‘genetically modified organism’

- 34. The scope of this policy work is largely limited to the regulations for laboratory research and biomedical R&D. In contrast, the definition of ‘genetically modified organism’ is based on the process/technique used, and does not make reference to the end uses of the technology nor the level of risk of the genetic modification.

35. This means that amendments to the definition to adjust the regulatory requirements for contained laboratory research, for instance by deregulating certain low-risk organisms from containment facility requirements, would be inconsistent (or incompatible) with the current definition.
36. Changing the definition completely so that it becomes risk-based would also require a full review and likely overhaul of the rest of the GMO provisions under the HSNO Act to ensure consistency.

Adding certain low-risk research to the Organisms Not Genetically Modified Regulations

37. This option would involve amendments to the *Hazardous Substances and New Organisms (Organisms Not Genetically Modified) Regulations 1998* (Not-GM Regulations) to exclude from regulations certain genetic modifications or genetically modified organisms from regulation. While this option would *technically* lower the regulatory requirements for laboratory research and biomedical research, like the option of changing the definition of GMOs above, this option would either be out of scope of this policy work or unworkable.
38. The scope of this policy work is confined to laboratory research and biomedical R&D. By deregulating through the Not-GM Regulations, the organisms in question would also be fully deregulated and would be able to be released into the environment, something that the risk-tiering framework under option 1 would not allow.
39. Deregulating certain research through the Not-GM regulations would also be inconsistent with those regulations. These regulations list organisms that are not considered to be genetically modified based on the *technique* used, not the risk-level of the genetic modifications being made or the organisms being modified.

EPA issuing a broad low-risk approval

40. In order for the EPA to issue a broad low-risk development approval, usable by anybody able to meet the requirements of that approval, would involve two steps:
 - the HSNO Act would have to be amended to allow the EPA to issue a broad low-risk approval without an application needing to be received by the EPA
 - the EPA would have to then issue this broad low-risk approval.
41. This would also be similar to approvals to import a large range of low-risk GMOs which can be used by any individual or organisation that can meet the requirements/controls of those import approvals.²⁵
42. However, this option is considered appropriate due to the independent role of the EPA. Due to the EPA's role as an independent government agency, it would be inappropriate for Cabinet or a Government to direct the EPA to issue an approval.²⁶

How do the options compare to the status quo/counterfactual?

We used these criteria to assess the suitability of each option, compared with the status quo:

²⁵ A list of existing import approvals that can be used by people other than the applicant can be found on the EPA website here: <https://epa.govt.nz/industry-areas/new-organisms/applying-for-approval/existing-approvals-you-could-use/>

²⁶ This is distinct from the HSNO Act's Call-in provision, which allows the Minister for the Environment to approve applications that the Minister for the Environment has "called-in".

- **Proportionality** – Will the policy be more proportionate or more proportionately regulate risks to the environment and the health and safety of people and communities?
- **Effectiveness** – Will the policy increase research outcomes and improve health outcomes for New Zealanders?
- **Future-proof** – Will the policy create a more up-to-date and/or future-proof regulatory framework for GMOs?
- **Efficiency** – Does the policy option reduce costs for users and is it able to be implemented within a reasonable timeframe and budget?

Example key for qualitative judgements:	
++	much better than doing nothing/the status quo/counterfactual
+	better than doing nothing/the status quo/counterfactual
0	about the same as doing nothing/the status quo/counterfactual
-	worse than doing nothing/the status quo/counterfactual
--	much worse than doing nothing/the status quo/counterfactual

Options considered	Proportionality	Effectiveness	Future-proof	Efficiency	Score
Option 1: Establish a risk-tiering framework modelled on the Australian risk-tiering framework	++	++ (Would lower regulatory requirements for research and remove EPA approval requirements for certain medicines)	++ (By starting from scratch would provide an opportunity to create more up to date regulations)	++	8
Option 2: Establish a risk-tiering framework that exempts certain low-risk research from EPA approval if conducted within a containment facility and if assessed by a biosafety committee	+ (Would increase the proportionality between PC1/PC2 containment facilities and PC3 containment facilities by removing EPA assessment requirements for PC1/PC2 containment facilities)	+ (While a containment facility would no longer be required for some research, researchers would not know in advance whether they would need a containment facility or not)	++ (Same as for option 1)	+ (EPA approval wouldn't be required but a containment facility would)	5
Option 3: Amend the Low-Risk Genetic Modifications Regulations	+ (Would increase the proportionality of the low-risk regulations)	0 (While a containment facility would no longer be required for some research, researchers would not know in advance whether they would need a containment facility or not)	+ (Applications would still be required but containment facilities would no longer be)	+ (Applications would still be required but containment facilities would no longer be)	3
Option 4: Status quo	0	0	0	0	0

What option is likely to best address the problem, meet the policy objectives, and deliver the highest net benefits?

43. Option 1– Establishing a risk-tiering framework modelled on the Australian risk-tiering framework is the initial preferred option.
44. Provided the research meets certain criteria and requirements, this option would exempt certain low-risk laboratory research from EPA assessment and approval requirements. For research meeting the criteria for Risk tier 1, it would also be able to be conducted in laboratories that are not approved as containment facilities. Research meeting the criteria of Risk tiers 2 and 3 would require a containment facility and assessment by a biosafety committee.
45. Of note, the rapid assessment provisions for low-risk GMO research would also be retained for low-risk research that may fall outside Risk tiers 1-3.
46. Should Cabinet agree to implement this risk-tiering framework following a public consultation, MfE in collaboration with the EPA would undertake additional consultation on the details of each risk tier, including what organisms, modifications, vectors, and exclusionary criteria would be included under each risk tier.
47. This is the initial preferred option because it would:
 - lower the administrative requirements for researchers to gain approval for low-risk laboratory research, increasing time available for research
 - remove any disincentive to researchers using organisms and vectors that would be best for their research, which may not be included under existing approvals that their organisation has
 - lower startup costs for new organisations and companies by removing the requirement to undertake certain research in a containment facility approved by MPI
 - remove the requirement for EPA assessment and approval for therapeutic products/medicines that are or contain GMOs that would present little to no risk to the environment or the health and safety of people and communities.
48. Reasons for the assessment score given are:
 - Proportionality: Would create an extra category of risk for no risk/very low risk research, for which an MPI-approved containment facility and assessment by a biosafety committee would be unnecessarily stringent requirements.
 - Effectiveness: This option would provide the lowest regulatory requirements of all the options. Lower requirements would be predicted to provide greater time and funding for research. This option would also remove the EPA approval requirements for medicines that meet the criteria of Risk tier 1 (thus improving health outcomes).
 - Future-proof: The regulations would be drafted from scratch. This would provide the opportunity to create a fully up to date set of regulations unconstrained by the drafting of existing regulations (like the Low-Risk Genetic Modification regulations).
 - Efficiency: As noted under 'Effectiveness', this option would provide the lowest regulatory requirements of all the options. This would remove the requirements for EPA assessment and approval and thus remove application fees and the cost of preparing applications. For certain research, it would also remove the requirement for a containment facility thus removing the capital and operational expenditures

required for a facility like this, including the cost of undertaking internal audits and preparing for external inspections which are required for containment facilities.

What are the marginal costs and benefits of the option?

Affected groups <i>(identify)</i>	Comment <i>nature of cost or benefit (eg, ongoing, one-off), evidence and assumption (eg, compliance rates), risks.</i>	Impact <i>\$m present value where appropriate, for monetised impacts; high, medium or low for non-monetised impacts.</i>	Evidence Certainty <i>High, medium, or low, and explain reasoning in comment column.</i>
Additional costs of the preferred option compared to taking no action			
Regulated groups	Cost to prepare application to accredit biosafety committee (one-off).	\$12,500 (estimate)	Low - Estimated 25 organisations that would apply, \$500 application fee - based on application fee for delegated authority. ²⁷
Regulators	Cost to the EPA to assess applications to accredit biosafety committees (one-off).	\$25,000 (estimate)	Low - \$1,000 estimated cost to the EPA, estimate of 25 organisations.
	Cost to audit Accredited Biosafety Committee assessments (ongoing).	\$12,500 (estimate)	Low - Estimate of 25 organisations, estimated average of 5 applications per organisation, 10% audit rate, estimated cost of \$1000 per audit assessment.
Others (eg, wider govt, consumers, etc.)	N/A – No additional costs identified.		
Total monetised costs		\$50,000 (estimate)	
Non-monetised costs		<i>(High, medium or low)</i>	
Additional benefits of the preferred option compared to taking no action			
Regulated groups	Lower startup costs for new companies and organisations (ongoing).	\$40,000 - \$160,000 (estimate)	Low – Estimated construction cost of \$4,000 per m ² for a PC1 lab, ²⁸ estimated 10m ² -20m ² for a small lab, estimated 1-2 startups that would benefit per annum.

²⁷ <https://www.epa.govt.nz/assets/Uploads/Documents/Hazardous-Substances/Fees-consultation-Feb-2023/Hazardous-Substances-and-New-Organisms-Fee-Proposals-consultation.pdf>

²⁸ <https://slattery.com.au/wp-content/uploads/2021/06/BEE-June-2021-Slattery.pdf>

	Cost savings from removal of requirement to assess medicines meeting Risk tier 1 criteria (ongoing).	\$10,000 - \$20,000 (estimate)	Low - Estimated 1-2 applications per annum, \$10,000 cost per application. ²⁹
Regulators	Cost savings from removal of requirement to assess medicines meeting Risk tier 1 criteria (ongoing).	\$50,000 - \$100,000 (estimate)	Low - Estimated 1-2 applications per annum, \$50,000 cost to EPA per application. ³⁰
Others (eg, wider govt, consumers, etc.)	Benefits to eligible patients from reduced delays to new biomedical treatments, due to removal of assessment requirements for Risk tier 1 medicines (ongoing)	\$1 million (estimate)	Medium – See <i>Benefits from reduced delays to treatment</i> (page 31)
	Research outcomes improved through researchers not being disincentivised from pursuing research outside of existing approvals, in turn leading to economy-wide benefits (ongoing)	\$140,000 (estimate)	Low – Conservative estimate of dollar value of research, equal to total salary of relevant researchers (1,000 x \$70,000 = \$70,000,000). Conservative estimate of 1% increase to quality of research outcomes, leading to 1% increase in economy-wide benefits.
Total monetised benefits		\$1.2-1.4 million (estimate)	
Non-monetised benefits		(High, medium or low)	

Potential risks from the preferred option

49. One potential risk from the preferred option is that it would increase the likelihood of no-risk to very-low-risk GMOs being inadvertently released into the environment. This is because the non-containment facility laboratories (ie, those not needing to be approved by MPI) would likely not have the same stringency of containment measures as MPI-

²⁹ <https://www.epa.govt.nz/assets/Uploads/Documents/Hazardous-Substances/Fees-consultation-Feb-2023/Hazardous-Substances-and-New-Organisms-Fee-Proposals-consultation.pdf>

³⁰ <https://www.epa.govt.nz/assets/Uploads/Documents/Hazardous-Substances/Fees-consultation-Feb-2023/Hazardous-Substances-and-New-Organisms-Fee-Proposals-consultation.pdf>

approved containment facilities. However, it is likely that the organisms selected for Risk tier 1 would be included under Risk tier 1 because they are reliant on specific laboratory conditions and do not have the ability to 'escape' from their containers. This would mean that the risk of these organisms making their way into the environment and then surviving would be highly unlikely.

50. Furthermore, while there would be an increased likelihood of these GMOs being inadvertently released into the environment from these laboratories, this is separate to the risk of harm/adverse effects to the environment and the health and safety of people and communities from these organisms. The no-risk to very-low-risk status of these organisms means that they would present negligible or no risk of harm/adverse effects to the environment and the health and safety of people and communities, even if they should be inadvertently released into the environment and survive.
51. In 2014 the Royal Society of New Zealand commissioned a review into the risks associated with the outdoor use of genetically modified organisms. This review noted that "current scientific evidence strongly supports the opinion that GMOs do not impose any greater risks as a result of their genetically modified status"³¹ and that "any risks imposed are a result of the host organism and the trait it expresses and are the same for an organism expressing a particular trait created by GM or by conventional means."³² As such, no-risk and very-low-risk GMOs would have the same risk status as no risk and very-low-risk non-genetically modified organisms.
52. Because the host organisms that would be included under Risk tier 1 of the proposed risk-tiering framework would be no-risk and very-low-risk host organisms, there is also negligible to no risk that a researcher could transform these host organisms into pathogenic organisms through simple genetic modifications. This is because pathogenicity does not occur through simply acquiring the gene encoding for a toxin (for instance). A set of "virulence-adaptive polymorphisms" and "pathoadaptive mutations" are required to be present in non-pathogenic organisms for acquired pathogenic genes to transform these organisms into pathogens.³³
53. Additionally, around 80% of worldwide DNA synthesis orders are screened for pathogenic sequences by companies that have signed up to the International Gene Synthesis Consortium (IGSC). IGSC members screen synthetic gene orders to identify regulated pathogen sequences and other potentially dangerous sequences as well as vetting those customers placing orders. Specifically, IGSC members screen the complete DNA and translated amino acid sequences of every double-stranded gene order against the IGSC's comprehensive curated Regulated Pathogen Database derived from international pathogen and toxin sequence databases.³⁴
54. Another risk from the preferred option is that for risk tiers that do not contain exhaustive lists of host organisms, researchers and internal biosafety committees may incorrectly classify research as meeting the criteria of a certain risk tier. Of note, this is also a risk that

³¹ Conner A. J., Glare T. R. and Nap J-P. (2003) The release of genetically modified crops into the environment - Part II. Overview of ecological risk assessment. *Plant J.* 33, 19–46

³² Leyser O. (2014). Moving beyond the GM Debate. *PLOS Biol.* 12, e1001887

³³ Almagro-Moreno, S. (2022). How Bacterial Pathogens Emerge. *American Scientist*, 110(3), 162-169. Available at: <https://www.americanscientist.org/article/how-bacterial-pathogens-emerge>

³⁴ More information can be found on the International Gene Synthesis Consortium's website here: <https://genesynthesisconsortium.org/>

is inherent to the broad approvals that have been granted to the University of Auckland, the University of Otago, and Massey University.³⁵ However, for those organisms that are considered not suitable for a certain risk tier, this risk could be mitigated by listing that organism under a higher risk tier, or explicitly excluding it from the risk-tiering framework. This risk of incorrect classification would be also reduced through organisms requiring assessment and clearance from MPI to be imported. It is also intended that assessments by internal biosafety committees will be audited by the EPA on a yearly basis, providing an additional level of scrutiny.

³⁵ For these Institutional Low Risk Approvals, one of the criteria for host organisms is: 'Risk Group 2 microorganisms including (but not limited to) Bacteria, Archaea, Viruses (including Bacteriophages), eukaryotic microbes (Algae, Fungi (including Yeasts), Phytoplankton, Zooplankton, Protozoa and Micro-invertebrates that may cause disease in humans, animals, plants, or fungi but are unlikely to be a serious hazard to laboratory personnel, the community, animals, or the environment, and have effective treatment and preventive measures with respect to any infections that they may cause, and present a limited risk of spread on infection.'

Issue Two – Assessment and approval of medicines that are or contain new organisms

Status quo and issues

55. Currently, medicines that are or contain new organisms (which includes GMOs) must be assessed and approved for “release” by the EPA, in addition to being approved by Medsafe in the case of human medicines and MPI in the case of veterinary medicines.³⁶
56. Applications to release organisms that are or are contained in medicines are made under section 34 of the HSNO Act. Section 38I of the HSNO Act also provides for the rapid assessment of these medicines if they are evaluated as low risk. Up to now, nearly all of these medicines have been rapidly assessed and approved by the EPA under section 38I (ie, assessed in less than 10 days).
57. To be rapidly assessed under section 38I, the EPA must evaluate and determine that these new organisms meet the criteria of a (low risk) ‘qualifying organism’ set out under section 38I(3).³⁷ If it meets this criteria, the EPA may make a rapid assessment of the adverse effects of the release of this organism and approve its release with or without controls.
58. Despite most applications so far being rapidly assessed by the EPA, the time taken to prepare application documents and delays before an application is formally accepted for rapid assessment mean that the application process may run into several weeks or months. The approval process to release a qualifying organism has been described as arduous and particularly lengthy, leading to delays for clinical trials.³⁸
59. Any delays in approval can be expected to have flow on effects for other aspects of research and clinical evaluation. As noted by one researcher: *“Regulatory delays adversely affect trial recruitment, trial feasibility, scientific importance of the findings, and trial budgets. They will also cause reputational damage as we deal with overseas collaborators, such as other researchers and global pharmaceutical companies that produce CAR T-cells.”*
60. Another issue with the current scope of section 38I of the HSNO Act is that it does not include medical devices. Under the Medicines Act 1981, the definition of medicine specifically does not include medical devices. This therefore excludes medical devices that are or contain new organisms from being rapidly assessed under section 38I, requiring them to be assessed under a full publicly notified pathway. While the Therapeutic Products Bill proposes to include both medicines and medical devices under the definition of a ‘therapeutic product’ (which would bring medical devices under section 38I of the HSNO Act), the time required to fully implement the Therapeutic Products Bill would leave this as a gap for several years.³⁹

Options

³⁶ Approval for the release of a qualifying organism under the HSNO Act does not constitute an approval to use that qualifying medicine until the medicine has been given consent for distribution under the Medicines Act 1981 or use under the Agricultural Compounds and Veterinary Medicines Act 1997.

³⁷ For a new organism to meet the definition of a ‘qualifying organism’ it must be, or be contained in, a ‘qualifying medicine’. For a medicine to be a ‘qualifying medicine’ it must contain a new organism and to meet the criteria set out under section 38I(3) of the HSNO Act.

³⁸ One researcher currently developing a medical treatment told MfE that it seemed like a ‘torturous’ process.

³⁹ The intention is for the HSNO Act to use the definition of therapeutic product defined under the Therapeutic Products Bill to ensure that no conflict between the two legislation for section 38I applications.

Option 1 – Remove ‘qualifying organism’ assessment to streamline medical application assessments:

61. This option would remove the current first stage of section 38I assessments, involving the evaluation of whether a new organism meets the criteria of a (low risk) ‘qualifying organism’.
62. By removing this first stage, medical release applications could be straightforwardly assessed for adverse effects (the current second stage of section 38I assessments), reducing information required from applicants and the EPA’s overall assessment time.
63. Under this proposed change the EPA would still retain the right to decline an application under section 38I, should they determine that a rapid assessment would be insufficient for a particular application. Those applications could then be evaluated under a full publicly notified assessment pathway.

Option 2 – Create an alternative assessment pathway:

64. Under this option an alternative assessment pathway would be introduced under section 38I for medicines that are unlikely to result in viable new organisms making their way into the environment. Under this alternative rapid assessment pathway, application information requirements would concentrate on whether through shedding or excretion the new organism is likely to make its way into the environment.
65. For an international example of this, Australia’s regulations currently differentiate between medicines in this way through two approval types: ‘Dealings involving an Intentional Release’ and ‘Dealings Not involving an Intentional Release’.
66. This change would have the benefit of reducing the amount of information and time required from researchers to complete applications.

Option 3 – Inclusion of medical devices under rapid assessment provisions:

67. This option would amend the medical release provisions of the HSNO Act so that medical devices that are or contain new organisms would be able to be rapidly assessed, rather than requiring assessment under a full publicly notified pathway.

Option 4 – Combination of options 1, 2 and 3:

68. As options 1-3 are not mutually exclusive, this option would combine these three options. That is, the medical release provisions of the HSNO Act would be amended to:
 - remove ‘qualifying organism’ assessment to streamline medical application assessments
 - create an alternative assessment pathway for medicines that are unlikely to result in viable new organisms making their way into the environment
 - include medical devices under rapid assessment provisions.

Option 5 – Status quo:

69. As outlined above, under the status quo medicines (but not medical devices) that are or contain a new organism would continue to be assessed under section 38I of the HSNO Act, with the first stage of the assessment being the evaluation of a ‘qualifying organism’ status.

How do the options compare to the status quo/counterfactual?

We used these criteria to assess the suitability of each option, compared with the status quo:

- **Proportionality** – Will the policy be more proportionate or more proportionately regulate risks to the environment and the health and safety of people and communities?
- **Effectiveness** – Will the policy increase research outcomes and improve health outcomes for New Zealanders?
- **Future-proof** – Will the policy create a more up-to-date and/or future-proof regulatory framework for GMOs?
- **Efficiency** – Does the policy option reduce costs for users and is it able to be implemented within a reasonable timeframe and budget?

Example key for qualitative judgements:

- ++ much better than doing nothing/the status quo/counterfactual
- + better than doing nothing/the status quo/counterfactual
- 0 about the same as doing nothing/the status quo/counterfactual
- worse than doing nothing/the status quo/counterfactual
- much worse than doing nothing/the status quo/counterfactual

Options considered	Proportionality	Effectiveness	Future-proof	Efficiency	Score
Option 1: Remove 'qualifying organism' assessment to streamline medical application assessments	0	+	0	+	2
Option 2: Introduce an additional assessment pathway under section 381 for medicines that are unlikely to result in viable new organisms making their way into the environment	+	+	+	++	5
Option 3: Amend section 381 of the HSNO Act to include the rapid assessment of medical devices that are, or contain, new organisms	+	+	+	++ (The information and funding required for a rapid assessment is likely to be significantly less than that required under a full pathway)	5
Option 4: Combination of options 1, 2 and 3	++ (These options both increase the proportionality of the provisions and decrease the disproportionate requirements for medical devices)	++ (All three of the options would decrease administrative requirements increasing research time and incentivising the creation of biomedical therapies)	++	++ (All three of the options would in their own way decrease the amount of time and effort required from researchers)	8
Option 5: Status quo	0	0	0	0	0

What option is likely to best address the problem, meet the policy objectives, and deliver the highest net benefits?

70. Option 4 – a combination of options 1 to 3 – is the initial preferred option. That is, the medical release provisions of the HSNO Act would be amended to:

- Remove ‘qualifying organism’ assessment to streamline medical application assessments
- Introduce an additional assessment pathway under section 38I for medicines that are unlikely to result in viable new organisms making their way into the environment
- Include medical devices that are or contain new organisms under the scope of section 38I.

71. This is the initial preferred option because it would:

- Lower the information requirements for section 38I applications, reducing the time, effort and funding required of researchers
- Reduce any delays to new treatments reaching patients that may be due to application requirements or assessments.

72. Reasons for the assessment score given are:

- Proportionality: Option 2 would increase the proportionality of the provisions while option 3 would decrease the disproportionate requirements for medical devices.
- Effectiveness: All three of the options would decrease administrative requirements, increasing research time available and decreasing any delays to new treatments reaching patients.
- Future-proof: Option 2 would bring the legislation up to date by acknowledging that different medicines have different potentials to result in organisms being released into the environment. Option 3 would bring the legislation up to date as not including medical devices under the ‘qualifying medicines’ provisions was likely an oversight (both medicines and medical devices will be included under the definition of ‘therapeutic products’ under the Therapeutic Products Bill which will replace the Medicines Act).
- Efficiency: All three of the options would in their own way decrease the amount of time and effort required from researchers to gain approval for medicines/medical devices that are or contain new organisms.

What are the marginal costs and benefits of the option?

Affected groups <i>(identify)</i>	Comment <i>nature of cost or benefit (eg, ongoing, one-off), evidence and assumption (eg, compliance rates), risks.</i>	Impact <i>\$m present value where appropriate, for monetised impacts; high, medium or low for non-monetised impacts.</i>	Evidence Certainty <i>High, medium, or low, and explain reasoning in comment column.</i>
Additional costs of the preferred option compared to taking no action			
Regulated groups	N/A – No costs identified.		
Regulators	Potential increase in the resources required at EPA to	\$100,000 (estimate)	Low – Estimated 2 extra applications per annum, estimated cost to EPA of

	assess additional applications (ongoing)		\$50,000 per application. ⁴⁰
Others (eg, wider govt, consumers, etc.)	N/A – No additional costs identified.		
Total monetised costs		\$0.1 million (estimate)	
Non-monetised costs		<i>(High, medium or low)</i>	
Additional benefits of the preferred option compared to taking no action			
Regulated groups	Cost savings due to lower application requirements (ongoing)	\$11,000 (estimate)	Low – Conservative estimate of 2 affected researchers (that would be tasked with drafting applications), estimate of two weeks of time saved, estimated \$150,000 average salary for senior scientist.
Regulators	N/A – No additional benefits identified		
Others (eg, wider govt, consumers, etc.)	Benefits to eligible patients from reduced delays to new biomedical treatments (ongoing)	\$1 million (estimate)	Medium - See rationale below.
	Increased funding available for R&D (due to cost savings) generates economy-wide benefits (ongoing)	\$22,000 (estimate)	Low - CSIRO estimate of AU\$3.5 benefit from AU\$1 spent on R&D ⁴¹ , so conservative estimate of NZ\$2 benefit from NZ\$1 diverted to R&D.
Total monetised benefits		\$1 million (estimate)	
Non-monetised benefits		<i>(High, medium or low)</i>	

Benefits from reduced delays to treatment

73. The provision of new treatments to patients can be delayed for a number of reasons, including manufacturing challenges, lack of insurance cover, and regulatory requirements. As new treatments must be more effective than existing treatment options to gain regulatory approval, delays to the provision of new treatments would result in lost value to

⁴⁰ <https://www.epa.govt.nz/assets/Uploads/Documents/Hazardous-Substances/Fees-consultation-Feb-2023/Hazardous-Substances-and-New-Organisms-Fee-Proposals-consultation.pdf>

⁴¹ <https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/CSIRO-futures/Innovation-Business-Growth/Quantifying-Australias-returns-to-innovation>

patients.⁴² Conversely, benefits to patients would accrue from reducing delays to new treatments, such as through reducing unnecessary regulatory restrictions.

74. Based on research by Snider et al. we can estimate some potential monetary and life-year benefits from reducing delays to new biomedical treatments in New Zealand.⁴³ This research estimated the social value from CAR T-cell treatments for Diffuse large B cell lymphoma (DLBCL) and Paediatric acute lymphoblastic leukaemia (pALL).⁴⁴ In addition, the authors also estimated the social value that would be lost due to treatment delays (ie, the length of delay for the first cohort of patients to receive a new treatment).⁴⁵ While the authors assume a price of treatment of US\$200,000 for their estimates, which may be lower than the current costs of CAR T-cell treatments in New Zealand, the authors also note that the wider literature suggests a 30% price reduction for these treatments by 2030.
75. Using the number of individuals that are diagnosed with these two cancers annual (250 and 36, respectively) and using conservative estimates of the percentage of those annual numbers that would be eligible for these treatments (30% and 15%, respectively), we get 75 and 5 eligible patients, respectively.
76. Using Snider et al.'s estimates for the per patient social value gained by CAR T-cell treatments for these two cancers (NZ\$462,061 and NZ\$1,546,448, respectively), compared to standard-of-care, the total social value generated for all eligible patients would be NZ\$34,654,575 and NZ\$8,350,819.
77. In terms of the costs to those social value from delays, using Snider et al.'s numbers we can estimate that a one-month delay to the first use of these new treatments would result in a reduction in social value of NZ\$1,455,492 and NZ\$818,380, respectively.⁴⁶ Life-years lost per patient from a one-month delay to the first use of these treatments were estimated at 0.2 (2.4 months) and 0.8 (9.6 months), respectively. The life-years lost in total for all patients from a one-month delay would be 15 life-years and 4.3 life-years, respectively.
78. From these numbers we could estimate that a one-month delay to the first use of a new biomedical treatment, potentially due to regulatory requirements, could result in the reduction in social value for New Zealanders that would have benefitted of around NZ\$1,000,000. If around one new treatment becomes available every one-to-two years, an average one-month delay to each new treatment would have an accumulated cost of between NZ\$5-10 million over 10 years. We could also estimate that a one-month delay could result in around 10 life-years lost.
79. These are likely to be realistic estimates based on data related to the latest CAR T-cell treatment approved in New Zealand. In July 2022, the EPA approved for "release" CARVYKTI, which is a CAR T-cell therapy for relapsed or refractory multiple myeloma. In its Staff Assessment, the EPA noted that "around 400 new cases of multiple myeloma are reported in New Zealand each year with almost all of them eventually left without many

⁴² This lost value could occur through having to use relatively less efficacious standard-of-care or from dying while waiting for a new treatment to become available.

⁴³ Snider, J. T., Brauer, M., Kee, R., Batt, K., Karaca-Mandic, P., Zhang, J., & Goldman, D. P. (2019). The potential impact of CAR T-cell treatment delays on society. *Am J Manag Care*, 25(8), 379-386.

⁴⁴ CAR T-cell therapies are personalised cancer therapies that use genetically modified-versions of a patient's own T-cells to attack their cancers.

⁴⁵ Social value is defined by Snider et al. as the sum of consumer surplus and manufacturer profit. Consumer surplus (also known as patient value) is the added value of health gains achieved by the therapy minus its incremental cost.

⁴⁶ A two-month delay would result in an estimated reduction in social value of NZ\$3,985,276 and NZ\$3,022,997, respectively. A six-month delay would result in an estimated reduction in social value of NZ\$15,941,105 and NZ\$5,620,101, respectively.

effective therapeutic options”.⁴⁷ As noted by Myeloma New Zealand in a submission to Pharmac in September 2022, around 150 people a year in New Zealand die from myeloma.⁴⁸ As CARVYKTI is approved as a therapy for relapsed or refractory myeloma, a significant proportion of those 150 people would likely be eligible to receive this treatment, giving numbers that are similar to those used above.

⁴⁷ APP204391 EPA Staff Assessment Report: <https://www.epa.govt.nz/assets/FileAPI/hsno-ar/APP204391/APP204391-EPA-staff-assessment-report.pdf>

⁴⁸ Myeloma New Zealand, Pharmac Submission: <https://www.multiplemyeloma.org.nz/wp-content/uploads/2022/09/Pharmac-Submission-September-2022.pdf>

Issue Three – Record-keeping requirements

Status quo and issues

80. Record-keeping requirements for new organisms (which includes GMOs) within containment facilities are prescribed under four standards for microorganisms and cell cultures, vertebrate laboratory animals, plants, and invertebrates.⁴⁹ These requirements vary according to each standard but generally include the species and strains of the organisms held. Additionally, they can include details on genetic modifications, corresponding HSNO Act approvals, dates of import, dates of development, researchers responsible for the organisms, and the status of the organism.
81. Recording-keeping requirements for low-risk research was one of the issues most frequently cited by researchers surveyed by MfE. In the view of researchers, the amount of time and effort required for maintaining these records was excessive considering the low risk of their research.
82. It is common for new GMOs to be created on a daily basis in most labs and records are required for each new GMO and every sample that contains each new GMO. This means that the cumulative time and energy required to create and maintain records across the many labs in New Zealand is likely to be very significant. According to a researcher interviewed by MfE, at the University of Auckland alone it was estimated that at least 200,000 GMOs are currently tracked and recorded.
83. Most importantly, it is unclear how record-keeping requirements and registers further reduce risk from already low-risk new organisms to sufficiently outweigh the costs to researchers. This is because fully verifying that an organism within a container matches its paperwork can only be accomplished through the use of a microscope by an inspector with sufficient expertise. As such, record-keeping and routine compliance monitoring of those records cannot be expected to act as an adequate means of identifying unauthorised research.
84. In contrast, full verification that a researcher is authorised to import a certain new organisms/GMO can be accomplished through assessing the commercial supplier paperwork that would accompany a package. Therefore, the compliance monitoring that is most pertinent for identifying potential unauthorised research is likely to be at the border (through importation authorisation carried out by MPI).
85. Thankfully, most, if not all, researchers in New Zealand wish to comply with regulations, as is commonly the case with regulated groups.⁵⁰ Despite best intentions, however, human fallibility is a factor that needs to be considered when setting controls. In labs that contain both new organisms and not-new organisms, accidental cross-contamination may be a risk that needs specific controls to mitigate.

⁴⁹ These are: 154.03.02 Facilities for Microorganisms and Cell Cultures 2007, 154-03-03 Containment facilities for vertebrate laboratory animals 2002, 155-04-09 Containment Facilities for Plants 2007, and 154.02.8 Transitional and containment facilities for invertebrates 2002. Standards for containment facilities are approved by the EPA under section 11(1)(fc) of the HSNO Act.

⁵⁰ That most regulated groups wish to comply with regulations forms the rationale for the VADE model for proportional, risk-based compliance monitoring and enforcement. VADE stands for Voluntary, Assisted, Directed and Enforced. The largest segment of this model represents those regulated groups that voluntarily wish to comply with regulations and are informed, the second largest represents those that are attempting to comply and are uninformed about how to comply, the next smallest represents those that have a propensity to offend (opportunistic), while the smallest group represents criminal intent and illegal activity.

86. Additionally, for those new organisms that are higher risk or have a higher risk of escape (as for certain animals), systems of accounting of GMOs in a laboratory would likely be appropriate.
87. In contrast to the record-keeping requirements set under the four standards mentioned above, the broad Institutional Low-Risk Approvals (ILRAs) given to the University of Auckland, University of Otago and Massey University require only that: *'The approved organism(s) must be identifiable as a new organism and be able to be linked to the relevant HSNO Act approval.'*⁵¹

Options

Option 1 – Replace record-keeping requirements with a 'New Organism' labelling requirement and an accounting requirement for higher risk organisms

88. This option would replace current record-keeping requirements with two requirements:
- new organisms, or containers that contain new organisms, must be labelled to indicate that they are, or contain, new organisms
 - a documented system of accounting must be in place for: a) new organisms in containment facilities operated at PC3 and b) animals in all containment facilities.⁵²
89. This would apply to all new organisms required to be held in containment facilities approved by MPI.
90. Additionally, if the preferred risk-tiering framework is implemented, for laboratories that do not need to be approved as containment facilities (as under Risk tier 1 of the preferred risk-tiering framework), legislation would also require that new organisms, or containers containing new organisms, must be labelled to indicate they are, or contain, new organisms. Because animals would be unlikely to be included under Risk tier 1, it is unlikely that the requirement for a documented system of accounting would be required for these laboratories.
91. The purpose of the labelling requirements would be to lower the likelihood of accidental/inadvertent cross-contamination between new organisms and not-new organisms in laboratories and containment facilities.
92. The higher risk of new organisms requiring a containment facility operated at PC3 to cause adverse effects, and the higher risk of escape of animals, means that an accounting system would likely be sensible to verify (for both researchers and compliance officers) that those new organisms have not escaped or been taken by unauthorized persons.⁵³
93. The same requirements are also set under Australia's GMO regulations. Under Australian regulations, researchers working with GMOs in PC1 and PC2 facilities are only required to label GMOs, or containers that contain GMOs, to indicate that they are, or contain, GMOs.⁵⁴ This labelling is done to ensure the separation of GMO and non-genetically modified organisms in the facility, and to lower the risk of accidental cross-contamination.

⁵¹ These Institutional Low-Risk Approvals are: APP202708, APP201859, and APP203504.

⁵² "Animals" refers to all organisms included under the kingdom *Animalia*.

⁵³ In addition to other control measures to ensure new organisms are contained and unauthorized persons are not able to gain entry to those containment facilities.

⁵⁴ Guidelines published by Australia's Office of the Gene Technology Regulator for these Physical Containment Facilities can be found here: <https://www.oqtr.gov.au/resources>

Accounting systems are also required for all PC3 facilities and for animals kept in all Physical Containment facilities.

Option 2 - Replace record-keeping requirements with a 'New Organism' and approval-linking labelling requirement, and an accounting requirement for higher risk organisms

94. Similar to option 1, this option would replace current record-keeping requirements with three requirements:
- new organisms, or containers that contain new organisms, must be labelled to indicate that they are, or contain, new organisms
 - new organisms, or containers that contain new organisms, must be able to be linked to the relevant HSNO Act approval or relevant Accredited Biosafety Committee assessment (should a risk-tiering framework be implemented)
 - a documented system of accounting must be in place for: a) new organisms in containment facilities operated at PC3 and b) animals in all containment facilities.⁵⁵
95. This would apply to all new organisms required to be held in containment facilities approved by MPI.
96. Additionally, if the preferred risk-tiering framework is implemented, for laboratories that do not need to be approved as containment facilities (as under Risk tier 1 of the preferred risk-tiering framework), legislation would also require that new organisms, or containers containing new organisms, must be labelled to indicate they are, or contain, new organisms.
97. In addition to the labelling and accounting requirements under option 1, this option would also include the HSNO Approval-linking requirements prescribed under the Institutional Low-Risk Approvals issued to the University of Auckland, University of Otago, and Massey University.

Option 3 – Status quo:

98. As outlined above, this option would retain the current record-keeping requirements as detailed under the relevant standards.

How do the options compare to the status quo/counterfactual?

We used these criteria to assess the suitability of each option, compared with the status quo:

- **Proportionality** – Will the policy be more proportionate or more proportionately regulate risks to the environment and the health and safety of people and communities?
- **Effectiveness** – Will the policy increase research outcomes and improve health outcomes for New Zealanders?
- **Future-proof** – Will the policy create a more up-to-date and/or future-proof regulatory framework for GMOs?
- **Efficiency** – Does the policy option reduce costs for users and is it able to be implemented within a reasonable timeframe and budget?

⁵⁵ Animals refers to all organisms included under the kingdom *Animalia*.

Example key for qualitative judgements:

++	much better than doing nothing/the status quo/counterfactual
+	better than doing nothing/the status quo/counterfactual
0	about the same as doing nothing/the status quo/counterfactual
-	worse than doing nothing/the status quo/counterfactual
--	much worse than doing nothing/the status quo/counterfactual

Options considered	Proportionality	Effectiveness	Future-proof	Efficiency	Score
Option 1: Replace current requirements with labelling and accounting requirements (for higher risk organisms)	++	++	0	++	6
Option 2: Replace current requirements with requirements for labelling, linking to approvals/ABSC assessment, and accounting requirements (for higher risk organisms)	++	+	0	+	4
Option 3: <i>Status quo</i>	0	0	0	0	0

What option is likely to best address the problem, meet the policy objectives, and deliver the highest net benefits?

99. Option 1 is the initial preferred option – replace current record-keeping requirements with two requirements:

- new organisms, or containers that contain new organisms, must be labelled to indicate that they are, or contain, new organisms
- a documented system of accounting must be in place for: a) new organisms in containment facilities operated at PC3 and b) animals in all containment facilities.⁵⁶

100. This would apply to all new organisms required to be held in containment facilities approved by MPI.

101. Additionally, if the preferred risk-tiering framework is implemented, for laboratories that do not need to be approved as containment facilities (as under Risk tier 1 of the preferred risk-tiering framework), legislation would also require that new organisms, or containers containing new organisms, must be labelled to indicate they are, or contain, new organisms. Because animals would be unlikely to be included under Risk tier 1, it is unlikely that the requirement for a documented system of accounting would be required for these laboratories.

102. This is the initial preferred option because it would:

- reduce administrative burden on researchers, increasing time available for research
- safeguard against accidental cross-contamination between new organisms and not new organisms

⁵⁶ “Animals” refers to all organisms included under the kingdom *Animalia*.

- enable researchers and MPI compliance officers to verify that higher risk new organisms and animals are accounted for
- free up researcher, biosafety officer, and compliance officer time to concentrate on areas of higher risk.

103. Reasons for the assessment score given are:

- **Proportionality:** Given current requirements are unlikely to decrease risks additional to the preferred option (as discussed in paragraphs 44-45), we consider this option to be more proportionate than the current requirements. In addition, requirements would also increase in proportionality with increasing levels of risk (for instance, from PC1 to PC3 and from no animals to animals). Therefore, we consider it to be 'much better than the status quo'.
- **Effectiveness:** This option would provide the lowest regulatory/operational requirements of the three options presented. Lower record-keeping requirements would be predicted to translate into greater research outcomes by freeing up time and funding that would have otherwise been spent on record-keeping.
- **Future-proof:** It was unclear to us how lowering the record-keeping requirements would be considered bringing the regulations 'up to date' or making them future-proof, so we consider this option to be 'about the same as the status quo' under this criteria.
- **Efficiency:** As noted under 'Effectiveness', this option would provide the least administrative requirements which would be expected to translate into lower costs for researchers and organisations.

What are the marginal costs and benefits of the option?

Affected groups <i>(identify)</i>	Comment <i>nature of cost or benefit (eg, ongoing, one-off), evidence and assumption (eg, compliance rates), risks.</i>	Impact <i>\$m present value where appropriate, for monetised impacts; high, medium or low for non-monetised impacts.</i>	Evidence Certainty <i>High, medium, or low, and explain reasoning in comment column.</i>
Additional costs of the preferred option compared to taking no action			
Regulated groups	Time required to update internal guidance documents (one-off)	<\$5,000 (estimate)	
Regulators	Time required to update internal verification guidance/training documents (one-off)	<\$1,000 (estimate)	
Others (eg, wider govt, consumers, etc.)	N/A – No additional costs identified.		
Total monetised costs		<\$6,000 (estimate)	
Non-monetised costs		<i>(High, medium or low)</i>	

Additional benefits of the preferred option compared to taking no action			
Regulated groups	Greater time and funding available for research and teaching due to fewer administrative requirements (ongoing)	\$0.7 million per annum (estimated monetised hours saved)	Low - Conservative estimate of 1000 affected researchers, ⁵⁷ conservative estimate of percentage of work time saved (1%), estimated average salary of \$70,000.
Regulators	Less time required for verifying compliance compared with the time required currently (ongoing)	<\$10,000 per annum (estimated monetised hours saved)	
Others (eg, wider govt, consumers, etc.)	Increased funding available for R&D generates economy-wide benefits, due to cost-savings (ongoing)	\$1.4 million per annum (estimated economy-wide benefits)	Low - CSIRO estimate of AU\$3.5 benefit from AU\$1 spent on R&D ⁵⁸ , so conservative estimate of NZ\$2 benefit from NZ\$1 diverted to R&D. Estimated 1000 affected researchers, ⁵⁹ conservative estimate of percentage of work time saved (1%), estimated average salary of \$70,000.
Total monetised benefits		\$2.1 million per annum (estimate)	
Non-monetised benefits		<i>(High, medium or low)</i>	

⁵⁷ The Royal Society estimated that in 2019 the FTE for university-based researchers was around 8,000 and the FTE for CRI-based researchers was 2,000. Their estimated FTEs did not include researchers at independent research organisations or private companies. Estimated average salaries are based on Payscale.com.

⁵⁸ <https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/CSIRO-futures/Innovation-Business-Growth/Quantifying-Australias-returns-to-innovation>

⁵⁹ The Royal Society estimated that in 2019 the FTE for university-based researchers was around 8,000 and the FTE for CRI-based researchers was 2,000. Their estimated FTEs did not include researchers at independent research organisations or private companies. Estimated average salaries are based on Payscale.com.

Issue Four - Audit frequency

Status quo and issues

104. Currently, standards set under the HSNO Act require that internal audits and inspections of containment facilities by MPI compliance officers are carried out on a regular basis.
105. These standards require an internal audit be carried out by a facility operator every six months. These standards also allow inspections to be carried out by MPI compliance officers at any time, though generally external audits are carried out every 12 months.
106. Researchers and biosafety officers/laboratory managers interviewed by the Ministry noted that the frequency of audits for containment facilities operated at PC1 and PC2 seemed unnecessarily high, considering the low risk of research carried out in these facilities. Both internal audits and inspections require time from facility staff and researchers. In the case of researchers, the administrative requirements for these audits would be expected to take away time that could be spent on their research.

Options

Option 1 – Reduce internal audit frequency for containment facilities operating at PC1:

107. Under this option, the frequency of internal audits for containment facilities operated at Physical Containment level 1 (PC1) would be reduced from six months to a minimum of 12 months. This change in audit frequency would apply to new organisms rather than just GMOs. This would ensure that those containment facilities operating at PC1 that hold both non-GMO new organisms and GMOs (with the same risk profile) would still benefit from a reduction in internal audit frequency.
108. The frequency of internal audits at Physical Containment level (PC2) facilities would remain at six months. In addition, the frequency of inspections for containment facilities would remain unchanged. MPI would also retain the right to conduct an inspection of a facility at any time.
109. These proposed audit frequencies are outlined in the table below:

	Internal audit frequency	External audit frequency
PC1 facilities	12 months (minimum)	12 months / Anytime
PC2 facilities	6 months (minimum)	12 months / Anytime

Option 2 - Reduce internal audit frequency for containment facilities operating at PC1 and PC2:

110. Under this option, the frequency of internal audits for containment facilities operating at PC1 and PC2 would be reduced from six months to 12 months. As for option 1, this change in audit frequency would apply to new organisms rather than just GMOs, ensuring that facilities that hold both non-GMO new organisms and GMOs (with the same risk profile) would still benefit from the reduction in internal audit frequency.
111. The current frequency of inspections for containment facilities would remain unchanged at 12 months. MPI would also retain the right to conduct an inspection of a facility at any time.
112. These proposed audit frequencies are outlined in the table below:

Internal audit frequency	External audit frequency
--------------------------	--------------------------

PC1 facilities	12 months (minimum)	12 months / Anytime
PC2 facilities	12 months (minimum)	12 months / Anytime

Option 3 – Remove internal audit frequency requirements for containment facilities operating at PC1 and reduce internal audit frequency requirements for containment facilities operating at PC2:

113. Under this option, the internal audit requirement for containment facilities operating at PC1 would be removed and the *minimum* frequency of internal audits for containment facilities operating at PC2 would be reduced from six months to 12 months. However, facility operators would still have the freedom to perform internal audits at a frequency greater than their minimum requirement.

114. The frequency of inspections for containment facilities would remain unchanged at 12 months. MPI would also retain the right to conduct an inspections of a facility at any time.

115. These proposed audit frequencies are outlined in the table below:

	Internal audit frequency	External audit frequency
PC1 facilities	No minimum requirement	12 months / Anytime
PC2 facilities	12 months (minimum)	12 months / Anytime

Option 4 – Status quo:

116. As outlined in the current situation section above, under this option internal audits of containment facilities would be required every six months and inspections would be carried out generally every 12 months (though they could also be undertaken by MPI at any time).

How do the options compare to the status quo/counterfactual?

We used these criteria to assess the suitability of each option, compared with the status quo:

- **Proportionality** – Will the policy be more proportionate or more proportionately regulate risks to the environment and the health and safety of people and communities?
- **Effectiveness** – Will the policy increase research outcomes and improve health outcomes for New Zealanders?
- **Future-proof** – Will the policy create a more up-to-date and/or future-proof regulatory framework for GMOs?
- **Efficiency** – Does the policy option reduce costs for users and is it able to be implemented within a reasonable timeframe and budget?

Example key for qualitative judgements:

- ++** much better than doing nothing/the status quo/counterfactual
- +** better than doing nothing/the status quo/counterfactual
- 0** about the same as doing nothing/the status quo/counterfactual
- worse than doing nothing/the status quo/counterfactual
- much worse than doing nothing/the status quo/counterfactual

Options considered	Proportionality	Effectiveness	Future-proof	Efficiency	Score
Option 1: Reduce the frequency of internal audits for PC1 facilities to a minimum of 12 months	++	+	0	+	4
Option 2: Reduce the frequency of internal audits for both PC1 and PC2 facilities to a minimum of 12 months	+	+	0	++	4
Option 3: Remove the internal audit requirement for PC1 facilities and reduce the frequency of internal audits for PC2 facilities to a minimum of 12 months	0 (Possibility that this frequency of internal audits may be either proportionate or disproportionately low)	+	0	++	3
Option 4: Status quo	0	0	0	0	0

What option is likely to best address the problem, meet the policy objectives, and deliver the highest net benefits?

117. Option 1 is the initial preferred option – This would have the effect of decreasing the frequency of internal audits for containment facilities operated at PC1 from six months to 12 months.

118. For these containment facilities this would mean that internal audits would be required every 12 months at a minimum, and inspections would be conducted every 12 months. For containment facilities operated at PC2 this would mean that internal audits would be required every six months at a minimum, and inspections would be conducted every 12 months.

119. This is the initial preferred option because it would:

- reduce the administrative burden for facility operators, their staff, and researchers across New Zealand
- proportionately regulate facilities according to the level of risk they may pose to the environment and the health and safety of people and communities
- retain the ability for MPI to conduct external audits at any time.

120. Reasons for the assessment score given are:

- Proportionality: We consider this to be ‘much better than the status quo’ because the level of audit frequency would increase as the level of Physical Containment increases. It would also be more proportionate due to the current internal audit

frequency (six months) likely being disproportionate to the low-risks of the research carried out in these facilities.

- Effectiveness: We consider this to be 'better than the status quo' because it would decrease administrative requirements on researchers. We don't consider this to be 'much better than the status quo' as the administrative requirements for internal audits for researchers is likely to not be as high as that for record-keeping requirements.
- Future-proof: It was unclear to us how reducing the frequency of internal audits would be considered bringing the regulations 'up to date' or making them future-proof so we consider this option to be 'about the same as the status quo' under this criteria.
- Efficiency: This option would reduce costs for users, though not as much as options 2 and 3.

What are the marginal costs and benefits of the option?

Affected groups <i>(identify)</i>	Comment <i>nature of cost or benefit (eg, ongoing, one-off), evidence and assumption (eg, compliance rates), risks.</i>	Impact <i>\$m present value where appropriate, for monetised impacts; high, medium or low for non-monetised impacts.</i>	Evidence Certainty <i>High, medium, or low, and explain reasoning in comment column.</i>
Additional costs of the preferred option compared to taking no action			
Regulated groups	N/A – No additional costs identified.		
Regulators	N/A – No additional costs identified.		
Others (eg, wider govt, consumers, etc.)	N/A – No additional costs identified.		
Total monetised costs			
Non-monetised costs		<i>(High, medium or low)</i>	
Additional benefits of the preferred option compared to taking no action			
Regulated groups	Greater time and funding available for research and teaching due to less administrative requirements (ongoing)	\$70,000 (estimate)	Low – Conservative estimate of 100 affected researchers / staff, estimate of percentage of work time saved (1%), average salary of \$70,000.
Regulators	Less time required for checking internal audit reports (ongoing)	<\$10,000	
Others (eg, wider govt, consumers, etc.)	Increased funding available for R&D generates economy-	\$140,000 (estimate of economy-wide benefits)	Low - CSIRO estimate of AU\$3.5 benefit from

	wide benefits, due to cost-savings (on-going)		AU\$1 spent on R&D, ⁶⁰ so conservative estimate of NZ\$2 benefit from NZ\$1 diverted to R&D.
Total monetised benefits		\$0.21 million (estimate)	
Non-monetised benefits		<i>(High, medium or low)</i>	

Potential risks from the proposed option

121. It has been noted by one government agency that there may be a risk that small non-compliances aren't picked up as they might have under the status quo, resulting in a more significant non-compliance occurring, increasing the risk to the environment and the health and safety of people.

122. However, evidence from Australia does not suggest that lower internal audit requirements would lead to significant non-compliances occurring. Unlike the preferred option (internal audits a minimum of 12 months), Australia does not require internal audits for PC1 facilities and only requires internal audits every 12 months for PC2 facilities. In their annual reports for the last three reporting periods, around a quarter of facilities on average were found to be non-compliant with a condition, with an average of one non-compliance for each facility. More importantly, each of the three reports notes:

- *Each incident of non-compliance was assessed according to established OGTR protocols and found to present negligible risk to human health and safety or to the environment, to be minor in nature, and to involve negligible or zero culpability. The OGTR takes a 'cooperative compliance' approach, with an emphasis on education, engagement and awareness-raising. Open communication by the OGTR, backed by strong regulation, has helped to create an environment of cooperative compliance.*

123. This shows that despite only requiring internal audits for PC2 facilities every 12 months, the Australian Office of the Gene Technology Regulator has not considered it necessary to increase the frequency of internal audits. The non-compliances that are likely to be found in New Zealand PC1 facilities would be expected to present even more negligible risk to human health and safety or to the environment than non-compliances occurring in PC2 facilities.

⁶⁰ <https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/CSIRO-futures/Innovation-Business-Growth/Quantifying-Australias-returns-to-innovation>

Issue Five – Movements of organisms between laboratories

Status quo and issues

124. Like record-keeping and audit frequency requirements, requirements for the transfer of new organisms between containment facilities are prescribed under four standards for microorganisms and cell cultures, vertebrate laboratory animals, plants, and invertebrates.⁶¹ The movement of new organisms between containment facilities requires a number of conditions to be met, including prior authorisation granted by MPI, appropriate packaging and labelling, authorisation from both facilities, and tracking of the transfer.
125. Meeting the requirements for the movement of new organisms requires time and effort from researchers in the New Zealand research community that may be over and above measures necessary to sufficiently reduce risk. Additionally, this time and effort likely negatively impacts collaboration between research teams in New Zealand and, by extension, eventual research outputs.
126. Researchers regarded the regulatory restrictions for transferring low-risk GMOs between containment facilities to be too stringent and requiring an amount of administrative work disproportionate to the risk of those organisms. These requirements for movements are also not graduated to be proportionate to the risk of the organisms in question.
127. Like the record-keeping requirements discussed above, it is not clear how assessment and approval by MPI further reduces risk beyond other control measures required. Any risks from low-risk organisms being transferred are likely sufficiently reduced through appropriate packaging (which is not checked as part of MPI assessment of movement applications), facility operators ensuring that the receiving facility has the same or greater Physical Containment level, and ensuring that the package was received.
128. Collaboration and sharing GMOs between research teams is an important aspect of innovation and producing research outputs. One researcher interviewed by MfE noted that New Zealand has a tight-knit research community relative to other countries, but this comparative advantage is likely stymied by the current movement requirements.

Options

Option 1 – Remove movement authorisation requirements for GMOs not requiring a containment facility:

129. Under the preferred risk-tiering framework under Issue 1, this option would remove the requirement for movement authorisation granted by MPI for GMOs not requiring a containment facility (as under Risk tier 1). The movement of these GMOs between facilities would be permitted provided the following conditions are met:
- the GMOs to be transported should be wholly contained inside a sealed, unbreakable primary container
 - the container should be labelled so as to indicate that it contains GMOs
 - the transport of these GMOs should be conducted in such a way to prevent the inadvertent release of those GMOs into the environment.

⁶¹ These are: 154.03.02 Facilities for Microorganisms and Cell Cultures 2007, 154-03-03 Containment facilities for vertebrate laboratory animals 2002, 155-04-09 Containment Facilities for Plants 2007, and 154.02.8 Transitional and containment facilities for invertebrates 2002. Standards for containment facilities are approved by the EPA under section 11(1)(fc) of the HSNO Act.

Option 2 – Remove movement authorisation requirements for GMOs requiring a containment facility operated at PC1:

130. This option would remove the requirement for movement authorisation granted by MPI for GMOs requiring a containment facility operated at Physical Containment level 1 (PC1). The movement of these GMOs would be permitted provided the following conditions are met:

- the organisms to be transported should be wholly contained inside a sealed, unbreakable primary container
- the container should be labelled so as to indicate that it contains GMOs/new organisms
- the containment facility they are being sent to is operated at a Physical Containment level that is equal to or greater than Physical Containment Level 1 (PC1)
- the facility operator of the sending facility confirms the movement meets these requirements
- both the sending and receiving facilities record the movement in a register.

Option 3 - Remove movement authorisation requirements for GMOs requiring a containment facility operated at PC2

131. This option would remove the requirement for movement authorisation granted by MPI for GMOs requiring a containment facility operated at Physical Containment level 2 (PC2). The movement of these GMOs would be permitted provided the following conditions are met:

- the organisms to be transported should be wholly contained inside a sealed, unbreakable primary container
- the container should be labelled so as to indicate that it contains GMOs/new organisms
- the containment facility they are being sent to is operated at a Physical Containment level that is equal to or greater than Physical Containment Level 2 (PC2)
- the facility operator of the sending facility confirms the movement meets these requirements
- both the sending and receiving facilities record the movement in a register.

Option 4 – Combination of options 1 and 2

132. This option would combine options 1 and 2. Under this option, the movement of new organisms between (non-containment facility) laboratories, and between containment facilities operated at PC1, would no longer require the authorisation of MPI. These movements would be required to meet several conditions relating to the packaging, labelling, adequate PC level, and recording the movement.

Option 5 - Status quo

133. As outlined in the current situation above, this option would retain the current requirements for the movement of GMOs between containment facilities.

How do the options compare to the status quo/counterfactual?

We used these criteria to assess the suitability of each option, compared with the status quo:

- **Proportionality** – Will the policy be more proportionate or more proportionately regulate risks to the environment and the health and safety of people and communities?

- **Effectiveness** – Will the policy increase research outcomes and improve health outcomes for New Zealanders?
- **Future-proof** – Will the policy create a more up-to-date and/or future-proof regulatory framework for GMOs?
- **Efficiency** – Does the policy option reduce costs for users and is it able to be implemented within a reasonable timeframe and budget?

Example key for qualitative judgements:	
++	much better than doing nothing/the status quo/counterfactual
+	better than doing nothing/the status quo/counterfactual
0	about the same as doing nothing/the status quo/counterfactual
-	worse than doing nothing/the status quo/counterfactual
--	much worse than doing nothing/the status quo/counterfactual

Options considered	Proportionality	Effectiveness	Future-proof	Efficiency	Score
Option 1: Under the proposed risk-tiering framework, remove movement authorisation requirements for GMOs not requiring a containment facility	+	+	0	++	4
Option 2: Remove the current movement authorisation requirements for GMOs requiring a containment facility operated at PC1	+	+	0	+	3
Option 3: Remove the current movement authorisation requirements for GMOs requiring a containment facility operated at PC2	0 (Possibility that this option could be either proportionate or disproportionately low)	+	0	+	2
Option 4: Combination of options 1 and 2	++	++	0	++	6
Option 5: <i>Status quo</i>	0	0	0	0	0

What option is likely to best address the problem, meet the policy objectives, and deliver the highest net benefits?

134. Our initial preferred option is option 4. This would remove current movement authorisation requirements for (non-containment facility) laboratories and containment facilities operating at PC1, provided specific conditions are met.

135. The movement of GMOs between (non-containment facility) laboratories would be permitted provided the following conditions were met:

- the GMOs to be transported should be wholly contained inside a sealed, unbreakable primary container
- the container should be labelled so as to indicate that it contains GMOs
- the transport of these GMOs should be conducted in such a way to prevent the inadvertent release of those GMOs into the environment.

136. The movement of GMOs between containment facilities operating at PC1 (or from PC1 to PC2 or PC3) would be permitted provided the following conditions are met:

- the organisms to be transported should be wholly contained inside a sealed, unbreakable primary container
- the container should be labelled so as to indicate that it contains GMOs/new organisms
- the containment facility they are being sent to is operated at a Physical Containment level that is equal to or greater than Physical Containment Level 1 (PC1)
- the facility operator of the sending facility confirms the movement meets these requirements
- both the sending and receiving facilities record the movement in a register.

137. This is the initial preferred option because it would:

- reduce the administrative burden on researchers to move/transfer GMOs to other laboratories and containment facilities
- reduce barriers to greater collaboration between researchers and laboratories in New Zealand
- places requirements on the movement of GMOs that are proportionate to their risk.

138. Because there would be very little to gain from a researcher not seeking sign-off from their containment facility operator and a considerable amount to lose (including the loss of that facility's certification), the condition listed under paragraph 97 would likely be a sufficient incentive for researchers to seek sign-off which would involve checks on packaging and that the receiving facility is adequate.

139. Reasons for the assessment score given are:

- **Proportionality:** Combined, we consider these options to be 'much better than the status quo' because they are proportional in the sense of the level of requirements increase as the level of containment requirements increase and would be more proportionate in that the current requirements are likely to be disproportionate for low-risk research.
- **Effectiveness:** We consider these options to be 'much better than the status quo' because they would decrease administrative requirements on researchers, likely leading to an increase in collaboration between researchers across New Zealand.
- **Future-proof:** It was unclear to us how reducing the requirements for movements/transfers would be considered bringing the regulations 'up to date' or making them future-proof, so we consider this option to be 'about the same as the status quo' under this criteria.
- **Efficiency:** These options would reduce the time currently required to complete paperwork and would reduce costs (via removal of application fees) for users.

What are the marginal costs and benefits of the option?

Affected groups <i>(identify)</i>	Comment <i>nature of cost or benefit (eg, ongoing, one-off), evidence and</i>	Impact <i>\$m present value where appropriate, for monetised impacts; high,</i>	Evidence Certainty <i>High, medium, or low, and explain reasoning in comment column.</i>

	<i>assumption (eg, compliance rates), risks.</i>	<i>medium or low for non-monetised impacts.</i>	
Additional costs of the preferred option compared to taking no action			
Regulated groups	N/A – No additional costs identified.		
Regulators	N/A – No additional costs identified.		
Others (eg, wider govt, consumers, etc.)	N/A – No additional costs identified.		
Total monetised costs			
Non-monetised costs		<i>(High, medium or low)</i>	
Additional benefits of the preferred option compared to taking no action			
Regulated groups	Cost savings from removal of movement authorisation fees (ongoing)	At least \$10,000 per annum (estimate)	Low - One medium-sized university estimated they spent \$1500 per annum on authorisation fees.
	Cost savings from removed need to fill out movement authorisation applications (ongoing)	At least \$5,000 per annum (estimate)	Low - Lower per hourly wage, but it is likely the time taken to fill out an application form would on average take twice as long as verification.
	Fewer administrative requirements encourages more collaboration (ongoing)	At least \$15,000 in research value gained per annum (estimate)	Low – Conservative estimate that current value of movements to research at least matches cost for authorisation, overall movements per annum double due to most significant cost being removed.
Regulators	Less time required to process applications (ongoing).	At least \$10,000 (estimate)	
Others (eg, wider govt, consumers, etc.)	Increased funding available for R&D from cost savings	\$30,000 per annum (estimate)	Low - CSIRO estimate of AU\$3.5 benefit from AU\$1 spent on R&D, ⁶²

⁶² <https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/CSIRO-futures/Innovation-Business-Growth/Quantifying-Australias-returns-to-innovation>

	(\$15,000) generates economy-wide benefits, due to cost-savings (on-going)		so conservative estimate of NZ\$2 benefit from NZ\$1 diverted to R&D.
Total monetised benefits		At least \$70,000 per annum (estimate)	
Non-monetised benefits		<i>(High, medium or low)</i>	

Issue Six - Regulatory requirements for the use of eukaryotic somatic cells

Status quo and issues

140. Currently, cells from all organisms, including human cells, are included under the definition of an ‘organism’ under the HSNO Act. As such, genetic modification of these cells would result in those cells being classified as GMOs and regulated by the HSNO Act. This means that approval is required from the EPA to import, develop, field test, and release genetically modified cells (including the “release” of cell-based medicines/therapies).
141. During the Ministry’s engagement with the New Zealand research community, the regulatory requirements to use and create genetically modified somatic (non-heritable) cells in a laboratory setting was frequently highlighted as an issue.
142. In the view of researchers, these cells pose essentially zero risk to the environment or people and are reliant on specific lab conditions, making their survival in the environment highly unlikely. In addition, stringent measures taken by researchers to eliminate environmental contamination of these cells means that their inadvertent escape from their containers is also highly unlikely.
143. In the case of genetically modified human cells and animal cells, the EPA also considers there to be essentially zero risk of these cells to the environment and people and communities, including to hospital staff.

Options

Option 1 – Include certain eukaryotic somatic cells under Risk tier 1 of the preferred risk-tiering framework:

144. Should the preferred risk-tiering framework be implemented (option 1 under [Issue One](#)), this option would include certain eukaryotic somatic cells under the risk tier exempt from EPA assessment and approval, and exempt from the requirement to be undertaken in an MPI-approved containment facility (Risk tier 1).⁶³
145. Specifically, these cells would be exempt from EPA assessment and approval for importation, development, and use as, or in, a medicine.⁶⁴ Under this risk tier, research using these cells would need to be undertaken within a laboratory and would not be permitted to be released into the environment.
146. The use of these cells would likely include conditions to ensure they remained low-risk such as:
- the donor nucleic acid must not be derived from organisms implicated in, or with a history of causing, disease in otherwise healthy human beings, animals, plants, or fungi

⁶³ These eukaryotic cells may be similar to those under Australia’s risk-tiering framework. Included under its Exempt risk-tier are: *Any of the following if they cannot spontaneously generate a whole animal: (a) animal or human cell cultures (including packaging cell lines); (b) isolated cells, isolated tissues or isolated organs, whether animal or human; (c) early non-human mammalian embryos cultured in vitro.* The risk-tier also includes: *Either of the following if they are not intended, and are not likely without human intervention, to vegetatively propagate, flower or regenerate into a whole plant: (a) plant cell cultures; (b) isolated plant tissues or organs.*

⁶⁴ This exemption from EPA assessment would not affect existing biosecurity requirements administered by the Ministry for Primary Industries, including existing importation approvals, and existing Medsafe approval for supply as a medicine.

- the donor nucleic acid must not code for a toxin with an LD₅₀ of less than 100 micrograms per kilogram
- if the donor nucleic acid includes a viral sequence it cannot give rise to infectious agents when introduced into any potential host species
- that the cells or tissues do not include germ cells, oocytes, zygotes or early embryos
- (where applicable to plant cells and tissues) that the cells or tissues cannot spontaneously generate a whole plant and are not regenerated into a whole plant.

Option 2 - Include certain eukaryotic somatic cells under Risk tier 2 of the preferred risk-tiering framework:

147. Should a risk-tiering framework be implemented (either option 1 or option 2 under [Issue One](#)), this option would include certain eukaryotic somatic cells under a risk tier exempt from EPA assessment and approval but requiring a containment facility operated at PC1.
148. Under this risk-tier, an Accredited Biosafety Committee at an organisation would assess the research using these cells to ensure that it meets the criteria for this risk tier (as well as the other proposed requirements associated with this risk tier).
149. The conditions associated with the use of these cells and tissue could also be similar to the conditions listed in option 1 above (paragraph 107).

Option 3 – Exclude certain somatic cell types from the definition of an organism under the HSNO Act:

150. This option would exclude certain somatic cell types from the definition of an ‘organism’ under the HSNO Act. Options could include:
- exclude somatic human cells from the definition of an organism
 - exclude somatic mammalian cells from the definition of an organism
 - exclude somatic animal cells (ie, all cells from organisms under the Kingdom *Animalia*) from the definition of an organism
 - exclude somatic eukaryotic cells from the definition of an organism.

Option 4 – Status quo:

151. As outlined in the current situation above, the current definition for an organism would remain unchanged, and the genetic modification of eukaryotic cells would still require EPA assessment and approval, and the use of a containment facility.

How do the options compare to the status quo/counterfactual?

We used these criteria to assess the suitability of each option, compared with the status quo:

- **Proportionality** – Will the policy be more proportionate or more proportionately regulate risks to the environment and the health and safety of people and communities?
- **Effectiveness** – Will the policy increase research outcomes and improve health outcomes for New Zealanders?
- **Future-proof** – Will the policy create a more up-to-date and/or future-proof regulatory framework for GMOs?
- **Efficiency** – Does the policy option reduce costs for users and is it able to be implemented within a reasonable timeframe and budget?

Example key for qualitative judgements:

- ++** much better than doing nothing/the status quo/counterfactual
- +** better than doing nothing/the status quo/counterfactual
- 0** about the same as doing nothing/the status quo/counterfactual
- worse than doing nothing/the status quo/counterfactual
- much worse than doing nothing/the status quo/counterfactual

Options considered	Proportionality	Effectiveness	Future-proof	Efficiency	Score
Option 1: Include certain eukaryotic cells under Risk tier 1 of the preferred risk-tiering framework	++	++	0	++	6
Option 2: Include certain eukaryotic cells under a risk tier exempt from EPA assessment and approval, but requiring a containment facility	+	+	0	+	3
Option 3: Exclude certain somatic cell types from the definition of an organism under the HSNO Act	+	++	-	++	4
	(More proportionate in the sense that PC1 is likely too stringent, but may be disproportionately low because it would not allow risk-reducing conditions to be set on their use)		(Would be harder to reverse should new information about risks come to light in future)		
Option 4: <i>Status quo</i>	0	0	0	0	0

What option is likely to best address the problem, meet the policy objectives, and deliver the highest net benefits?

152. Option 1 is the initial preferred option, which is the inclusion of certain eukaryotic somatic cells under a risk tier exempt from EPA assessment and approval requirements and exempt from the requirement for a containment facility.

153. This is the initial preferred option because it would:

- reduce administrative burdens to use no-risk/very-low-risk organisms, increasing research time and funding
- likely increase research using human cells, in turn leading to an increase in biomedical research and development outcomes
- retain the ability, compared to option 3, to regulate the use of the eukaryotic somatic cells included under this risk tier, either through conditions set in the regulations or controls set through standards.

154. Reasons for the assessment score given are:

- Proportionality: We consider this option to be ‘much better than the status quo’ because the current requirements (both EPA assessment/approval and a

containment facility) are likely to be disproportionate to the risks of eukaryotic somatic cells.

- **Effectiveness:** We consider this option to be ‘much better than the status quo’ because by removing EPA assessment and approval requirements, removing containment facility requirements, and removing current administrative requirements on researchers, research outcomes from the use of eukaryotic somatic cells are likely to increase.
- **Future-proof:** If it is now commonly agreed that somatic cells pose essentially no risk, and it wasn’t agreed at the time of the drafting of the HSNO Act, one might consider that this option would bring the regulations up to date. However, we are unsure whether this is the case so have assessed this option as being ‘about the same as the status quo’ under this criteria.
- **Efficiency:** As noted under ‘Effectiveness’ this option would reduce the time currently required to complete applications and administrative requirements and would reduce costs for users, including start-up costs for new organisations and businesses.

What are the marginal costs and benefits of the option?

Affected groups <i>(identify)</i>	Comment <i>nature of cost or benefit (eg, ongoing, one-off), evidence and assumption (eg, compliance rates), risks.</i>	Impact <i>\$m present value where appropriate, for monetised impacts; high, medium or low for non-monetised impacts.</i>	Evidence Certainty <i>High, medium, or low, and explain reasoning in comment column.</i>
Additional costs of the preferred option compared to taking no action			
Regulated groups	N/A – No additional costs identified.		
Regulators	Internal verification guidance/training documents would need to be updated (one-off).	<\$5,000	
Others (eg, wider govt, consumers, etc.)	N/A – No additional costs identified.		
Total monetised costs		<\$5,000	
Non-monetised costs		<i>(High, medium or low)</i>	
Additional benefits of the preferred option compared to taking no action			
Regulated groups			
Regulators	Cost savings from removal of requirement to assess medicines meeting Risk tier 1 criteria (ongoing).	(\$25,000-\$50,000 – half of \$50,000-\$100,000 estimate under Issue One)	Eukaryotic somatic cells, like human cells, are likely to make up at least half of the medicines benefiting from no EPA approval requirement.

Others (eg, wider govt, consumers, etc.)	Benefits to eligible patients from reduced delays to new biomedical treatments, due to removal of assessment requirements for Risk tier 1 medicines (ongoing)	(\$500,000 - half of \$1 million estimate under Issue One)	Eukaryotic somatic cells, like human cells, are likely to make up at least half of the medicines benefiting from no EPA approval requirement.
Total monetised benefits		(\$525,000 - \$550,000)	
Non-monetised benefits		(High, medium or low)	

VERVE-101 Clinical Trial

155. Of relevance to the potential benefits of including eukaryotic somatic cells, particularly human cells, under Risk tier 1 of the proposed risk-tiering framework is the VERVE-101 clinical trials that have been approved to be undertaken in New Zealand.
156. This clinical trial, which is also being run in the United Kingdom, will involve patients with familial (inherited) hypercholesterolemia and cardiovascular disease. The aim of therapy is to reduce the levels of certain types of cholesterol that are raised in these conditions.
157. The therapy used in these clinical trials is a type of gene editing called base-editing. Base-editing allows changes to be made to one base pair in an organism's DNA.⁶⁵ Because the modification of the patient's DNA will occur within the patient's body (which is referred to as *in vivo*) rather than the modification being made to a patient's cells that are then re-infused back into the patient (referred to as *in vitro*), the therapy in question is not regulated by the HSNO Act.
158. That New Zealand was chosen as one of the countries to host this clinical trial (allowing a patient in New Zealand to be the first in the world to receive this therapy) is suggestive of the benefits that could accrue should the current EPA approval requirements for biomedical therapies be lessened or removed. The removal of EPA approval requirements for cell-based therapies is likely to encourage more clinical trials and medicines using these therapies in New Zealand.
159. Similarly, CAR T-cell therapies (a type of personalised cancer therapy) are not regulated under Australia's GMO regulations, meaning they do not require approval from the Office of the Gene Technology Regulator. Australia has currently approved three CAR T-cell therapies, compared to one that is approved in New Zealand. Nine clinical trials for CAR T-cell therapies have also been approved in Australia, compared to one in New Zealand.

⁶⁵ Bases refer to the different letters (A,C,T,G) that make up a genetic sequence. Each base has a corresponding pair, A pairs with T and C pairs with G. Base editing can change a A:T pair to a C:G pair, or a C:G pair to a A:T pair.

Issue Seven - Regulatory status of certain biotechnologies

Status quo and issues

160. Whether the use of a biotechnology is regulated by the HSNO Act is determined by the definitions of the HSNO Act, regulations under the HSNO Act, and statutory determinations made by the EPA.⁶⁶
161. The definition of a genetically modified organism in the HSNO Act sets out at a high level those gene technologies that would be regulated in New Zealand under the HSNO Act:
- genetically modified organism means, unless expressly provided otherwise by regulations, any organism in which any of the genes or other genetic material—*
- (a) have been modified by in vitro techniques; or*
- (b) are inherited or otherwise derived, through any number of replications, from any genes or other genetic material which has been modified by in vitro techniques*
162. Additionally, biotechnologies exempt from regulation are also listed under the *Hazardous Substances and New Organisms (Organisms Not Genetically Modified) Regulations 1998* (Not-GM Regulations). Under these regulations, for example, biotechnologies such as chemical mutagenesis or cell fusion are specified as technologies that would not result in a GMO.
163. An application can also be made for a statutory determination by the EPA to determine whether an organism is a new organism for the purposes of the HSNO Act (or whether a new organism is created by a specific technology).
164. While statutory determinations can and do function as a means by which the regulatory status of biotechnologies under the HSNO Act can be clarified, the utility of statutory determinations is limited in two ways. The first is that statutory determinations must be applied for and cannot be initiated by the EPA. The second is that existing statutory determinations are publicly available but may not be easily discoverable by researchers or companies.

Options

Option 1 – Clarification of the status of RNA introduced into an organism

165. This option would clarify under regulations that *introduction of RNA (ribonucleic acid) into an organism* would not result in the creation of a GMO (according to exclusionary criteria). Examples of this technology include mRNA vaccines, such as the Pfizer vaccine for SARS-CoV-2.
166. Exclusionary criteria associated with this clarification could include that the introduction of RNA:
- cannot result in an alteration of the organism's genome sequence
 - cannot give rise to an infectious agent.
167. This would involve the addition of a subclause under section 3 of the *Organisms Not Genetically Modified Regulations*.

⁶⁶ At its simplest, biotechnology is technology based on biology. Biotechnology harnesses cellular and biomolecular processes to solve problems and develop useful products.

Option 2 - Clarification of the status of DNA introduced into an organism

168. This option would clarify that *introduction of DNA (deoxyribonucleic acid) into an organism* would not result in the creation of a GMO (according to exclusionary criteria). As for RNA above, examples of this technology include DNA vaccines, which are an advancing technology.

169. Exclusionary criteria associated with this clarification could include that the introduction of DNA:

- cannot result in an alteration of the organism's genome sequence
- cannot give rise to an infectious agent
- cannot be independently replicative.

170. This would involve the addition of a subclause under section 3 of the Organisms Not Genetically Modified Regulations.

Option 3 – Clarification of the status of epigenetic modifications

171. This option would clarify that epigenetic modifications would not result the creation of a GMO. Epigenetic modifications are modifications to the expression of genes that do not change the underlying genetic sequence of an organism.

172. This would involve the addition of a subclause under section 3 of the Organisms Not Genetically Modified Regulations.

Option 4 – Combination of options 1, 2 and 3

173. This option would combine options 1, 2 and 3. That is, this option would clarify the regulatory status of:

- the introduction of RNA into an organism
- the introduction of DNA into an organism
- epigenetic modifications.

Option 5 – Status quo

174. As outlined in the current situation above, the current Not-GM Regulations would remain unchanged.

How do the options compare to the status quo/counterfactual?

We used these criteria to assess the suitability of each option, compared with the status quo:

- **Proportionality** – Will the policy be more proportionate or more proportionately regulate risks to the environment and the health and safety of people and communities?
- **Effectiveness** – Will the policy increase research outcomes and improve health outcomes for New Zealanders?
- **Future-proof** – Will the policy create a more up-to-date and/or future-proof regulatory framework for GMOs?
- **Efficiency** – Does the policy option reduce costs for users and is it able to be implemented within a reasonable timeframe and budget?

Example key for qualitative judgements:

- ++** much better than doing nothing/the status quo/counterfactual
- +** better than doing nothing/the status quo/counterfactual
- 0** about the same as doing nothing/the status quo/counterfactual
- worse than doing nothing/the status quo/counterfactual
- much worse than doing nothing/the status quo/counterfactual

Options considered	Proportionality	Effectiveness	Future-proof	Efficiency	Score
Option 1: Clarify that organisms that result from the introduction of RNA are not regarded as genetically modified organisms under the HSNO Act	0	+	+	0	2
Option 2: Clarify that organisms that result from the introduction of DNA are not regarded as genetically modified organisms under the HSNO Act	0	+	+	0	2
Option 3: Clarify that epigenetic modifications do not result in genetically modified organisms under the HSNO Act	0	+	+	0	2
Option 4: Combination of options 1, 2 and 3	0	++	++	+	5
Option 5: Status quo	0	0	0	0	0

What option is likely to best address the problem, meet the policy objectives, and deliver the highest net benefits?

175. Option 4 is the initial preferred option – a combination of options 1, 2 and 3. This would clarify under the Not-GM Regulations that the introduction of RNA, the introduction of DNA, and epigenetic modifications, do not result in the creation of GMOs.

176. This is the initial preferred option because it would:

- provide greater clarity and certainty to researchers, potentially encouraging the increased use of these technologies in research and the development of medical therapies
- codify previous statutory determinations that may not be known of by researchers or readily discoverable.

177. Reasons for the assessment score given are:

- Proportionality: Because the addition of these technologies to the Not-GM Regulations would not make any regulatory restrictions more proportionate, since there are currently none, we have assessed this as being ‘about the same as the status quo’.
- Effectiveness: We consider this option to be ‘much better than the status quo’ because the inclusion of these biotechnologies under the Not-GM Regulations would provide both greater clarity and greater certainty to researchers and developers in the biotechnology and biomedical space.

- Future-proof: We consider this option to be ‘much better than the status quo’ because legislation would be bought up to date through the listing of these biotechnologies under the Not-GM Regulations.
- Efficiency: We consider this option to be ‘better than the status quo’ as it is likely to lower costs for businesses and researchers where there may have been a need for these businesses and researchers to seek legal advice on the regulatory status of these biotechnologies. This option would also remove the need for businesses and researchers that may have applied for statutory determinations to clarify the regulatory status of these biotechnologies.

What are the marginal costs and benefits of the option?

Affected groups <i>(identify)</i>	Comment <i>nature of cost or benefit (eg, ongoing, one-off), evidence and assumption (eg, compliance rates), risks.</i>	Impact <i>\$m present value where appropriate, for monetised impacts; high, medium or low for non-monetised impacts.</i>	Evidence Certainty <i>High, medium, or low, and explain reasoning in comment column.</i>
Additional costs of the preferred option compared to taking no action			
Regulated groups	N/A – No additional costs identified.		
Regulators	N/A – No additional costs identified.		
Others (eg, wider govt, consumers, etc.)	N/A – No additional costs identified.		
Total monetised costs			
Non-monetised costs		<i>(High, medium or low)</i>	
Additional benefits of the preferred option compared to taking no action			
Regulated groups	Cost savings for companies through lower legal and administrative costs (ongoing)	At least \$10,000 (estimate)	Hourly rates for a business lawyer can range from \$200-\$600
Regulators	N/A – No additional benefits identified.		
Others (eg, wider govt, consumers, etc.)	Greater clarity and certainty for researchers and businesses could see an increase of research using these biotechnologies,	>\$530,000 (estimate)	Low - Estimated \$39 million losses from varroa mite in 2020, estimated \$14 million spent by beekeepers to manage varroa in 2019. ⁶⁷ Conservative estimate (1%) that EPA’s previous

⁶⁷ <https://www.mpi.govt.nz/dmsdocument/48496-Economic-costs-of-pests-to-New-Zealand-Technical-report>

	leading to more research and health outcomes (ongoing)		statutory determination encouraged APP204363 (dsRNA treatment for varroa mite) and that that dsRNA is effective against varroa mite.
Total monetised benefits		>\$540,000 (estimate)	
Non-monetised benefits		(High, medium or low)	

First potential risk from the preferred option

178. One potential risk of the preferred option is that incorrect legislation drafting results in the inadvertent deregulation of instances of a technology that were not intended to be deregulated. However, we consider that the likelihood of this occurring is low for two reasons. The first is that the technologies and potential regulatory conditions will be consulted on as part of our consultation. Submissions received as part of this consultation will include researchers in the biotechnology field who are likely to raise considerations and potential issues with legislative drafting. The second is that part of the legislative drafting process will include consultation with the EPA. Both of these will act as a point at which feedback will occur on legislative drafting.

179. It is also likely that because primary legislation definitions set out what is regarded as genetic modification, developers are likely to seek clarification from the EPA should they be unsure if their use of RNA, DNA or epigenetic modification technologies may result in genetic modification. Developers seeking clarification from the EPA in regards to what is and is not genetic modification (outside of statutory determination applications) is a common occurrence. These requests for clarification would then signal that the secondary legislation would need to be amended for further clarification, which could then be achieved through an Order in Council rather than needing to be achieved through a Bill in the House.

Issue Eight - Low-risk fermentation

Status quo and issues

180. Fermentation (“bulking up”) of genetically modified organisms is an essential part of the manufacture of a range of products and biomedical therapies, such as vaccines.
181. The HSNO Act currently requires that applicants wishing to carry out fermentation of GMOs at volumes greater than 10 litres per vessel must gain approval for that fermentation, either by applying for a separate fermentation approval or including fermentation approval in an importation or development application. Like other application types involving low-risk GMOs, applications for low-risk fermentation can also be assessed by the EPA under a rapid assessment pathway.
182. Safety requirements for personnel at large-scale fermentation facilities are also prescribed under the Health and Safety at Work Act 2015, which specifies the duties of Persons Conducting a Business or Undertaking (PCBU) who manage, control, install, construct, or commission fermentation vessels.⁶⁸
183. While fermentation applications can be rapidly assessed (or included in other applications) the time required of researchers and organisations to complete these applications would be expected to take time and funding away from research and development.

Options

Option 1 – Replace EPA assessment and approval requirements with assessment by Accredited Biosafety Committees

184. Under our preferred risk-tiering framework (option 1 under Issue One), EPA approval requirements would be removed for the fermentation of GMOs meeting the criteria of risk tiers 1 to 3, provided the fermentation is undertaken in a containment facility and is assessed by an Accredited Biosafety Committee (ABSC).
185. For fermentation, risk-tiers would have the following features:

Risk tier	Conditions and requirements
Risk tier 1	<p>Fermentation of GMOs meeting the criteria of this risk tier could be undertaken up to a volume of 10 litres per vessel.</p> <p>Fermentation at volumes greater than 10 litres would have to meet the requirements of Risk tier 2: a containment facility operating at Physical Containment Level 1 (PC1) and assessment of the fermentation proposal by an ABSC.</p>
Risk tier 2	<p>Research meeting the criteria of this risk tier would be exempt from EPA assessment and approval requirements, provided the research is:</p> <ul style="list-style-type: none">• conducted in a containment facility operated at Physical Containment Level 1 (PC1)• is assessed by an ABSC and a record of the assessment is provided to the EPA on an annual basis.

⁶⁸ These are specified under sections 38 and 43 of the Health and Safety at Work Act 2015. Fermentation vessels are included under the definition of a *plant*.

	In addition to confirming that the research meets the criteria of Risk tiers 1 or 2, the ABSC would also need to be satisfied that proposed controls would be adequate to fully contain a spill from the fermentation vessel.
Risk tier 3	<p>As for Risk tier 2, research meeting the criteria of this risk tier would be exempt from EPA assessment and approval requirements, provided the research is:</p> <ul style="list-style-type: none"> • conducted in a containment facility operated at Physical Containment Level 2 (PC2) • is assessed by an ABSC and a record of the assessment is provided to the EPA on an annual basis. <p>In addition to confirming that the research meets the criteria of Risk tier 3, the ABSC would also need to be satisfied that proposed controls would be adequate to fully contain a spill from the fermentation vessel.</p>

186. All other fermentation that does not meet the criteria for Risk tiers 1-3 would require a fermentation approval from the EPA before being undertaken.

Option 2 – Replace EPA assessment and approval requirements with assessment by Accredited Biosafety Committees, remove containment facility requirements for very-low-risk research

187. Under our preferred risk-tiering framework (option 1 under Issue One), EPA assessment and approval requirements would be removed for the fermentation of GMOs meeting the criteria of risk tiers 1 to 3.

188. Fermentation meeting the criteria of Risk tier 1 would not require a containment facility, nor assessment by an ABSC.

189. Fermentation meeting the criteria of Risk tiers 2 and 3 would require containment facilities operated at PC1 and PC2, respectively. They would also require assessment by an ABSC prior to being undertaken.

190. For fermentation, risk-tiers would have the following features:

Risk tier	Conditions and requirements
Risk tier 1	<p>Fermentation of GMOs meeting the criteria of this risk tier would be exempt from EPA approval requirements for fermentation.</p> <p>(A potential legislative requirement that could be placed on fermentation under this risk tier is that measures must be put in place so that the entire contents of the vessel would be fully contained should a spill occur.)</p>
Risk tier 2	<p>Research meeting the criteria of this risk tier would be exempt from EPA assessment and approval requirements, provided the research is:</p> <ul style="list-style-type: none"> • conducted in a containment facility operated at Physical Containment Level 1 (PC1) • is assessed by an ABSC and a record of the assessment is provided to the EPA on an annual basis.

	In addition to confirming that the research meets the criteria of Risk tiers 1 or 2, the ABSC would also need to be satisfied that proposed controls would be adequate to fully contain a spill from the fermentation vessel.
Risk tier 3	<p>As for Risk tier 2, research meeting the criteria of this risk tier would be exempt from EPA assessment and approval requirements, provided the research is:</p> <ul style="list-style-type: none"> • conducted in a containment facility operated at Physical Containment Level 2 (PC2) • is assessed by an ABSC and a record of the assessment is provided to the EPA on an annual basis. <p>In addition to confirming that the research meets the criteria of Risk tier 3, the ABSC would also need to be satisfied that proposed controls would be adequate to fully contain a spill from the fermentation vessel.</p>

191. All other fermentation that does not meet the criteria for Risk tiers 1-3 would require a fermentation approval from the EPA before being undertaken.

Option 3 – Increase the maximum vessel size

192. Increase the maximum fermentation vessel size after which EPA assessment and approval is required. This maximum fermentation vessel size is currently set at 10 litres per vessel.

193. Researchers and organisations with existing and new approvals to import or develop GMOs would be able to ferment these organisms under this new maximum vessel size without requiring EPA approval.

194. Possible maximum vessel sizes before EPA assessment and approval are required could be 20 litres, 25 litres, and 50 litres.

Option 4 – Status quo

195. As outlined in the current situation above, this option would retain the requirement to gain approval for fermentation of GMOs at volumes greater than 10 litres per vessel.

How do the options compare to the status quo/counterfactual?

We used these criteria to assess the suitability of each option, compared with the status quo:

- **Proportionality** – Will the policy be more proportionate or more proportionately regulate risks to the environment and the health and safety of people and communities?
- **Effectiveness** – Will the policy increase research outcomes and improve health outcomes for New Zealanders?
- **Future-proof** – Will the policy create a more up-to-date and/or future-proof regulatory framework for GMOs?
- **Efficiency** – Does the policy option reduce costs for users and is it able to be implemented within a reasonable timeframe and budget?

Example key for qualitative judgements:

++	much better than doing nothing/the status quo/counterfactual
+	better than doing nothing/the status quo/counterfactual
0	about the same as doing nothing/the status quo/counterfactual
-	worse than doing nothing/the status quo/counterfactual
--	much worse than doing nothing/the status quo/counterfactual

Options considered	Proportionality	Effectiveness	Future-proof	Efficiency	Score
Option 1: Replace EPA assessment and approval with ABSC assessment	+	+	0	+	3
Option 2: Replace EPA assessment and approval with ABSC assessment, remove containment facility requirements for very-low-risk fermentation	0/+ (Would create a more proportionate set of regulations, but fermentation outside of a containment facility, even with the requirement for spill containment, may be a disproportionately low requirement)	+	0	+	2 or 3
Option 3: Increase the maximum fermentation vessel size after which EPA assessment and approval is required	0	0/+ (Not clear how this would significantly increase research or health outcomes)	0	+ (Would lower the number of EPA approvals required, though wouldn't lower the administrative requirements for larger fermentation)	1 or 2
Option 4: Status quo	0	0	0	0	0

What option is likely to best address the problem, meet the policy objectives, and deliver the highest net benefits?

196. Option 1 is MfE's initial preferred option. This would remove EPA assessment and approval requirements for fermentation, under risk tiers 1 to 3. For research that meets the criteria for risk tier 1, fermentation greater than 10 litres would require a PC1 facility and assessment of the fermentation proposal by an accredited biosafety committee.
197. For research that meets the criteria for risk tiers 2 and 3, fermentation greater than 10 litres would not require EPA assessment and approval, provided the fermentation is undertaken in a PC1 or PC2 facility, respectively, and the fermentation proposal is assessed by an accredited biosafety committee.
198. As part of the assessment requirement for risk tiers 1-3, the accredited biosafety committee must be satisfied that the controls that would be put in place are adequate to fully contain a spill from the fermentation vessel. Assessment by an accredited biosafety committee is likely to provide sufficient risk management oversight for the fermentation of low-risk organisms within a containment facility.

199. The new fermentation requirements under the risk-tiering framework would not replace any existing fermentation approvals.
200. For option 3, while a higher maximum fermentation level before EPA approval is required may be more proportionate for containment facility at PC1 research, fermentation of organisms that require a containment facility at PC2 or PC3 would pose a higher risk to the environment and people. This option would cover fermentation at all PC levels. Hence the assessment that for 'Proportionality' this option is considered 'about the same as the status quo'.⁶⁹
201. This is the initial preferred option because it would:
- reduce the administrative burden on researchers, organisations, and companies, by requiring fewer applications for fermentation to be completed
 - proportionately regulate fermentation according to the level of risk it may pose to the environment and the health and safety of people and communities.
202. Reasons for the assessment score given are:
- **Proportionality:** We consider this option to be 'better than the status quo' as it would increase the proportionality of requirements for lower- and higher-risk research. While option 2 could potentially have the same score as option 1, fermentation outside of a containment facility, even with a requirement for adequate spill containment, may be a disproportionately low regulatory requirement in regard to risk.
 - **Effectiveness:** We consider this option to be 'better than the status quo' because it would lower the administrative burden for both vessel sizes used for research and larger vessel sizes used for development. This would remove any disincentive to undertaking fermentation research caused by EPA assessment and approval requirements.
 - **Future-proof:** It was unclear to us how reducing the requirements for fermentation would be considered bringing the regulations 'up to date' or making them future-proof, so we consider this option to be 'about the same as the status quo' under this criteria.
 - **Efficiency:** We consider this option to be 'better than the status quo' as it is likely to lower application costs for businesses and researchers.

What are the marginal costs and benefits of the option?

Affected groups <i>(identify)</i>	Comment <i>nature of cost or benefit (eg, ongoing, one-off), evidence and assumption (eg, compliance rates), risks.</i>	Impact <i>\$m present value where appropriate, for monetised impacts; high, medium or low for non-monetised impacts.</i>	Evidence Certainty <i>High, medium, or low, and explain reasoning in comment column.</i>
Additional costs of the preferred option compared to taking no action			

⁶⁹ While setting different maximum fermentation levels for each PC Level would technically increase proportionality, PC levels are not confirmed until after an EPA assessment and approval. This means that applicants whose fermentation would just exceed the maximum fermentation level may not realise they needed to include a fermentation approval until after an EPA assessment and approval.

Regulated groups	N/A – No additional costs identified		
Regulators	N/A – No additional costs identified.		
Others (eg, wider govt, consumers, etc.)	N/A – No additional costs identified.		
Total monetised costs			
Non-monetised costs		<i>(High, medium or low)</i>	
Additional benefits of the preferred option compared to taking no action			
Regulated groups	More research involving fermentation is encouraged, leading to beneficial research outcomes (ongoing)	>\$15,000 per annum (estimate)	Low – Conservative estimate of two extra fermentation research projects undertaken, conservative estimate that the (monetised) benefits of this research match the costs (2 weeks of a senior researcher’s time earning \$150,000 + application fee of \$1500).
Regulators	Fewer applications for fermentation would mean lower resource requirements for the EPA (ongoing)	\$3,500-\$20,000 per annum (estimate)	Low - Cost to the EPA is between \$3,500-\$20,000 per application, conservative estimate of one less application per annum.
Others (eg, wider govt, consumers, etc.)	N/A – No additional benefits identified.		
Total monetised benefits		\$18,500-\$35,000 per annum (estimate)	
Non-monetised benefits		<i>(High, medium or low)</i>	

Potential risks from the preferred option

203. A potential risk from the preferred option is that the likelihood of inadvertent spills from fermentation vats may increase. This might occur because controls that the EPA would have placed on the fermentation were not in place. However, we consider it unlikely that this would occur. This is because controls (whether those are prescriptive or outcome-based) for fermentation would likely be set under standards to replace the controls that the EPA requires as part of its approvals. Secondly, internal audits and inspections of those facilities conducting fermentation would still occur, thereby ensuring that the measures put in place by facility operators to ensure that spills from fermentation vessels met standards. Finally, the Accredited Biosafety Committee assessment would include that the committee is satisfied that appropriate measures are in place to fully contain any inadvertent spills.

204. In conclusion, we consider that the potential risk from the preferred option due to the potential increase in the likelihood of inadvertent spills is minor. Further we consider that there would be adequate checks in place to reduce this likelihood to a negligible level. As such, we consider that the risks of this preferred option are significantly outweighed by the benefits outlined in the table above.

Issue Nine – Standards for containment facilities

Status quo and issues

205. Requirements for containment facilities that handle GMOs are currently specified under four standards approved under the HSNO Act and the Biosecurity Act 1993.⁷⁰ These standards cover containment facilities and transitional facilities for microorganisms and cell cultures, vertebrate laboratory animals, plants, and invertebrates.⁷¹
206. Of note, these standards were produced at least 15 years ago (two in 2002 and two in 2007) and have not been updated since then. As such, there may be aspects of these standards that are no longer fit-for-purpose or are overly restrictive. Additionally, in their present format, updating these standards may require a significant amount of time and resourcing from both the EPA and MPI.
207. Since the publication of these four standards, the EPA has also moved towards 'outcome-based' controls for the approvals it grants. These outcome-based controls allow researchers to establish controls in their containment facilities that are most appropriate to the specific organism and research in question, rather than implementing the prescribed controls under the current standards, which can at times not provide the best control and containment of GMOs.
208. However, one challenge of outcome-based controls is that to identify measures that would provide adequate containment, technical knowledge and expertise is required from both those who implement the measures and those who verify the measures (ie. compliance officers). While large organisations, such as universities, may have the funding and human resources available to implement outcome-based controls, smaller organisations may find prescriptive controls easier to implement.

Options

Option 1 – Shift to outcome-based standards

209. An alternative option to the current status quo is to replace the current standards with one or multiple outcome-based standards for containment facilities that hold new organisms. This standard (or standards) would apply to new organisms across a range of types, including microorganisms, cells, vertebrate animals, invertebrate animals, and plants.
210. Where relevant, these controls would only supersede the controls for new organisms currently set under the four standards cited above and would not supersede any specific controls for not-new organisms or controls for transitional facilities, which are set under the Biosecurity Act 1993. The controls under this standard would likely be similar to the outcome-based controls required under the Institutional Low-Risk Approvals granted to the University of Auckland, University of Otago, and Massey University.
211. In addition to these outcome-based controls for new organisms, several domain-specific and Physical Containment (PC) level-specific guides would be developed. These guides would outline how outcome-based controls could be effectively implemented, potentially through providing common principles for facility operators to consider and

⁷⁰ These are: 154.03.02 Facilities for Microorganisms and Cell Cultures 2007, 154-03-03 Containment facilities for vertebrate laboratory animals 2002, 155-04-09 Containment Facilities for Plants 2007, and 154.02.8 Transitional and containment facilities for invertebrates 2002. Standards for containment facilities are approved by the EPA under section 11(1)(fc) of the HSNO Act.

⁷¹ Transitional facilities are regulated under the Biosecurity Act 1993.

examples of best practice. The development of these guidance documents could also be done through collaboration between relevant government agencies and industry representatives.

212. An example of this is the '*Generally accepted practice in New Zealand zoo containment facilities – Guidance document*'.⁷² This guidance document, prepared by MPI in collaboration with industry representatives, functions as a guide to understanding and implementing the requirements set out in the Standard for Zoo Containment Facilities 2018. It gives examples of how a zoo containment facility can meet the requirements of the standard but does not replace the requirements contained in the standard.
213. One consideration is that new organisms held in facilities that are approved as both containment facilities and transitional facilities would be technically subject to both outcome-based controls and prescriptive controls. However, in these scenarios operators of these facilities would not incur extra costs as they could meet outcome-based controls through continuing to use their existing prescribed control measures.

Option 2 – Shift to 'hybrid' standards

214. This hybrid option would be similar to the outcome-based standards option above but would combine aspects of the status quo. Under this approach, outcome-based standards would be specified for containment facilities that hold new organisms. In addition, measures that would meet these outcome-based controls (referred to hereafter as default measures) would be specified. Under this approach, facility operators could either choose to implement the default measures that would meet the outcome-based controls or could implement other non-default measures that would also meet the outcome-based controls.
215. A benefit of this option is that facility operators with facilities that function as both containment facilities and transitional facilities could continue using their current control measures, as these controls would likely be set as default measures under hybrid standards. Facility operators would also be able to implement non-default measures that would meet the outcome-based controls, delivering benefits if those measures were easier or less costly to implement or would better contain GMOs.
216. As for the outcome-based option above, domain-specific and Physical Containment (PC) level-specific guides would also be developed to provide guidance on how outcome-based controls could be effectively implemented.
217. In our view, the benefits of shifting to outcome-based standards, either under the outcome-based option or the hybrid option, is that they would:
- allow laboratories to implement validated, peer-reviewed control measures that are most appropriate to the specific organism and modifications in question, rather than potentially insufficient measures currently set under prescriptive standards
 - more widely disseminate biosafety knowledge and expertise through the publication of guides on how to effectively implement outcome-based controls
 - require less resources to update guidance for containment facilities in future compared to the resources required to update standards.
218. Under both the outcome-based and hybrid option outlined, a shift in approach to outcome-based controls also provides the opportunity to incorporate aspects of the 2019

⁷² This can be found here: <https://www.mpi.govt.nz/dmsdocument/34935-Generally-Accepted-Practice-in-New-Zealand-Zoo-Containment-Facilities>

International Standard for Biorisk Management (ISO 35001) or other international manuals such as the WHO Laboratory Biosafety manual into published guides.⁷³ ISO 35001 is an outcome-based standard that can be used to improve the overall biorisk performance of laboratories and research facilities. The inclusion of information from these documents would in our view also demonstrate New Zealand's commitment to international best practice and continuous improvement in the area of biorisk management.

Option 3 - Status quo

219. This option would maintain the current status quo: prescriptive standards for containment facilities that hold new organisms. Changes may be made to specific controls prescribed under these standards, but the overall approach going forward would remain the same.

220. A benefit of this option is that standards for containment facilities and transitional facilities would have the same broad approach. Small organisations with containment facilities may also find it easier to implement measures that meet prescriptive controls compared to the effort that may be required to meet outcome-based standards.

221. As noted above however, the downside to this approach is that prescriptive controls may not provide adequate control and containment of organisms in all scenarios.

How do the options compare to the status quo/counterfactual?

We used these criteria to assess the suitability of each option, compared with the status quo:

- **Proportionality** – Will the policy be more proportionate or more proportionately regulate risks to the environment and the health and safety of people and communities?
- **Effectiveness** – Will the policy increase research outcomes and improve health outcomes for New Zealanders?
- **Future-proof** – Will the policy create a more up-to-date and/or future-proof regulatory framework for GMOs?
- **Efficiency** – Does the policy option reduce costs for users and is it able to be implemented within a reasonable timeframe and budget?

Example key for qualitative judgements:	
++	much better than doing nothing/the status quo/counterfactual
+	better than doing nothing/the status quo/counterfactual
0	about the same as doing nothing/the status quo/counterfactual
-	worse than doing nothing/the status quo/counterfactual
--	much worse than doing nothing/the status quo/counterfactual

Options considered	Proportionality	Effectiveness	Future-proof	Efficiency	Score
Option 1: Outcome-based standards	+	0	+	0	2

⁷³ For more information on the International Organization for Standardization's ISO 35001:2019 and the World Health Organisation's Laboratory biosafety manual 4th edition, see: <https://www.iso.org/standard/71293.html> and <https://www.who.int/publications/i/item/9789240011311>

		(Not clear that this would contribute to better research and health outcomes)	(Should better ways of containment be identified in future, outcome-based controls would allow them to be used)	(For smaller organisations, implementing outcome-based measures may be more costly, though outcome-based measures could decrease costs for other organisations)	
Option 2: Hybrid approach (Outcomes-based controls + Prescriptive controls)	+	0 (Same as above)	+	+	3
Option 3: Prescriptive controls (Status quo)	0	0	0	0	0

What option is likely to best address the problem, meet the policy objectives, and deliver the highest net benefits?

222. Option 2 is the initial preferred option. Under this hybrid option, outcome-based standards (as in option 1) would be combined with aspects of the status quo.

223. That is, outcome-based standards would be specified for containment facilities that hold new organisms and, in addition, measures that would meet these outcome-based controls ('default measures') would be specified. Under this approach, facility operators could either choose to implement the default measures that would meet the outcome-based controls or could implement other non-default measures that would also meet the outcome-based controls.

224. This is the initial preferred option because it would:

- allow laboratories to implement validated, peer-reviewed control measures that are most appropriate to the specific organism and modifications in question, rather than potentially insufficient measures currently set under prescriptive standards
- more widely disseminate biosafety knowledge and expertise through the publication of guides on how to effectively implement outcome-based controls
- require less resource to update guidance for containment facilities in future compared to the resource required to update standards.

225. A shift in approach to an outcome-based standard combined with guides also provides the opportunity to incorporate aspects of the 2019 International Standard for Biorisk Management (ISO 35001) or other international manuals such as the WHO Laboratory Biosafety manual into published guides.⁷⁴

What are the marginal costs and benefits of the option?

Affected groups (identify)	Comment nature of cost or benefit (eg, ongoing, one-off),	Impact \$m present value where appropriate,	Evidence Certainty High, medium, or low, and
-------------------------------	---	---	---

⁷⁴ For more information on the International Organization for Standardization's ISO 35001:2019 and the World Health Organisation's Laboratory biosafety manual 4th edition, see: <https://www.iso.org/standard/71293.html> and <https://www.who.int/publications/i/item/9789240011311>

	<i>evidence and assumption (eg, compliance rates), risks.</i>	<i>for monetised impacts; high, medium or low for non-monetised impacts.</i>	<i>explain reasoning in comment column.</i>
Additional costs of the preferred option compared to taking no action			
Regulated groups	N/A – No additional costs identified.		
Regulators	Additional training (and training materials) would likely be required of verification officers to verify outcome-based measures (ongoing)	\$75,000 per annum (estimate)	Low – Estimate of 0.5 FTE (of \$150,000) per annum to develop and maintain training for outcome-based standards
Others (eg, wider govt, consumers, etc.)	N/A – No additional costs identified.		
Total monetised costs		\$0.07 million per annum	
Non-monetised costs		<i>(High, medium or low)</i>	
Additional benefits of the preferred option compared to taking no action			
Regulated groups	Cost savings through researchers being able to implement control measures that would require less time and money (ongoing)	\$350,000 per annum (estimate)	Low – Conservative estimate of 500 affected researchers / staff, estimate of percentage of work time/money saved (1%), average salary of \$70,000.
Regulators	N/A – No additional benefits identified.		
Others (eg, wider govt, consumers, etc.)	N/A – No additional benefits identified.		
Total monetised benefits		\$0.35 million per annum	
Non-monetised benefits		<i>(High, medium or low)</i>	

Issue 10 - Reviews of regulatory settings

Status quo and issues

226. A common criticism of the current GMO regulations in New Zealand is that they are out of date, having not been fully reviewed in more than 20 years. During this time, biotechnologies have advanced significantly, as has our collective understanding of the benefits and risks of biotechnologies.
227. With the rapid pace of advances in biotechnology, there may be a need for New Zealand's GMO regulations to be reviewed semi-frequently to ensure they regulate the space appropriately and are not out-of-date.
228. As there is currently no provision under the HSNO Act requiring regular reviews of the Act's GMO provisions and settings, reviews are dependent on either MfE deciding to undertake a review as part of its stewardship role or in response to Ministerial direction.⁷⁵ Both of these options are impacted by competing priorities, reducing the likelihood of necessary reviews being undertaken.

Options

Option 1 – HSNO Act requirement to review the GMO regulatory framework every five years

229. A provision would be added to the HSNO Act requiring the Ministry for the Environment to conduct a review of the regulatory settings for GMOs at least every five years (or another similar length of time).⁷⁶
230. A written report of each review, which would include recommendations for changes to the regulatory settings (if applicable), would be provided to the Minister for the Environment.
231. This review would also encompass horizon-scanning for new biotechnologies (and the regulatory settings appropriate for these new technologies) and relevant recent changes to regulations in other international jurisdictions.

Option 2 – HSNO Act requirement to review the GMO regulatory framework every five years, and consult on the findings

232. Similar to option 1, a provision would be added to the HSNO Act requiring the Ministry for the Environment to conduct a review of the regulatory settings for GMOs, and to publicly consult on their review findings, at least every five years (or another similar length of time).
233. A written report of each review and a written report on submissions to the consultation, as well as any recommendations for changes to the regulatory settings (if applicable), would be provided to the Minister for the Environment and made publicly available.
234. As for option 1, this review would also encompass horizon-scanning for new biotechnologies (and the regulatory settings appropriate for these new technologies) and relevant recent changes to regulations in other international jurisdictions.

Option 3 - Status quo

⁷⁵ While statutory determinations can function as a means by which regulations can be updated, a limitation is that they must be based on the drafting and definitions of the primary legislation which may themselves be out-of-date

⁷⁶ This provision could also allow an independent party to conduct the review on behalf of the Ministry.

235. As outlined in the current situation above, under this option no review of the regulatory settings for GMOs would be required under legislation. Reviews would be conducted according to the discretion of the Ministry for the Environment as part of their stewardship role, or at the direction of the Government.

How do the options compare to the status quo/counterfactual?

We used these criteria to assess the suitability of each option, compared with the status quo:

- **Proportionality** – Will the policy be more proportionate or more proportionately regulate risks to the environment and the health and safety of people and communities?
- **Effectiveness** – Will the policy increase research outcomes and improve health outcomes for New Zealanders?
- **Future-proof** – Will the policy create a more up-to-date and/or future-proof regulatory framework for GMOs?
- **Efficiency** – Does the policy option reduce costs for users and is it able to be implemented within a reasonable timeframe and budget?

Example key for qualitative judgements:	
++	much better than doing nothing/the status quo/counterfactual
+	better than doing nothing/the status quo/counterfactual
0	about the same as doing nothing/the status quo/counterfactual
-	worse than doing nothing/the status quo/counterfactual
--	much worse than doing nothing/the status quo/counterfactual

Options considered	Proportionality	Effectiveness	Future-proof	Efficiency	Score
Option 1: Provision added to the HSNO Act requiring MfE to conduct a review of the regulatory framework for GMOs at least every five years	++ (Not guaranteed, but regular reviews would likely result in the regulations remaining proportionate over time)	++ (Not guaranteed, but regular reviews would likely result in the improvement of the regulations over time)	++	+ (Not guaranteed, but regular reviews would likely deliver efficiencies for users over time)	7
Option 2: Provision added to the HSNO Act requiring MfE to conduct a review of the regulatory framework for GMOs, and then publicly consult on the review findings, at least every five years	++ (Same as for option 1)	++ (Same as for option 1)	++	0/+ (While consultation may better identify issues, this consultation would delay the enactment of improvements and may be redundant should the review result in policy changes that are themselves consulted on)	6 or 7
Option 3: Status quo	0	0	0	0	0

What option is likely to best address the problem, meet the policy objectives, and deliver the highest net benefits?

236. Option 1 is the initial preferred option, which would introduce a provision into the HSNO Act requiring the Ministry for the Environment to review the regulatory settings for GMOs, at least every five years (or another similar length of time).

237. This is the initial preferred option because it would:

- reduce the likelihood of regulatory settings remaining inappropriate, disproportionate, and out-of-date for long periods of time
- encourage horizon-scanning and regulatory work in anticipation of coming advances in biotechnology.

What are the marginal costs and benefits of the option?

Affected groups <i>(identify)</i>	Comment <i>nature of cost or benefit (eg, ongoing, one-off), evidence and assumption (eg, compliance rates), risks.</i>	Impact <i>\$m present value where appropriate, for monetised impacts; high, medium or low for non-monetised impacts.</i>	Evidence Certainty <i>High, medium, or low, and explain reasoning in comment column.</i>
Additional costs of the preferred option compared to taking no action			
Regulated groups	N/A – No additional costs identified.		
Regulators	Resources would be required from MfE (and some from other relevant agencies) to conduct the review and consult at least every five years (ongoing)	\$300,000 every five years (estimate)	Low – Likely around 2 FTE over the space of a year required (2x \$150,000)
Others (eg, wider govt, consumers, etc.)	N/A – No additional costs identified.		
Total monetised costs		\$0.06 million (\$60,000 per annum)	
Non-monetised costs		<i>(High, medium or low)</i>	
Additional benefits of the preferred option compared to taking no action			
Regulated groups	(See below)		
Regulators	N/A – No additional benefits identified.		
Others (eg, wider govt, consumers, etc.)	Better research and health outcomes for New Zealanders, and better outcomes for researchers, resulting from amendments that improve the regulatory framework (ongoing)	>\$2,780,000 every five years (estimate)	Low – Estimate of 50% likelihood that reviews will result in changes to the regulatory framework that would deliver at least as much

			benefits as preferred options outlined above (\$5,560,000).
Total monetised benefits		>\$0.55 million per annum	
Non-monetised benefits		<i>(High, medium or low)</i>	

Section 3: Delivering an option

How will the new arrangements be implemented?

238. Should Cabinet agree to implement the preferred options outlined in this document, changes will be required to the:

- Hazardous Substances and New Organisms Act 1996 (HSNO Act)
- Hazardous Substances and New Organisms (Organisms Not Genetically Modified) Regulations 1998
- Standards that prescribe requirements for containment facilities.

239. In addition, should Cabinet agree to implement the preferred risk-tiering framework option outlined under Issue One, secondary legislation would need to be created for this framework. The preferred options that would require changes to the HSNO Act (primary legislation change), which would require a bill to be introduced to Parliament are:

- Risk-tiering framework (Issue One)⁷⁷
- Assessment and approval of medicines that are or contain new organisms (Issue Two)
- Reviews of regulatory settings (Issue 10)

240. Additions to the *Hazardous Substances and New Organisms (Organisms Not Genetically Modified) Regulations 1998* would be required to implement the preferred option outlined under Issue Seven (Regulatory status of certain biotechnologies).

Consequential amendments to other legislation

241. In order for *Risk tier 1 - new organisms/GMOs that are to be contained in non-MPI-approved facilities* to be given biosecurity clearance under the Biosecurity Act 1993, an amendment would be required to section 28 (*Restrictions on giving clearances*) of the Biosecurity Act 1993. This amendment would allow an inspector to authorise that a new organism/GMO can go to that laboratory if it meets the criteria of Risk tier 1.

242. Alternatively, the section of the HSNO Act that refers to the risk-tiering framework could be added to section 28B *Biosecurity clearance for certain new organisms and qualifying organisms*. This section specifies which sections of the HSNO Act for which the requirements of section 28 do not apply.

Operation and enforcement

243. Under the proposed risk-tiering framework outlined in Issue One, there will be a number of new operational roles for the EPA. These include assessing and approving applications for the accreditation of biosafety committees (as well as their renewal at regular intervals), yearly audits of assessment reports from accredited biosafety committees (ABSCs), and the maintenance of an EPA biosafety committee (either as a stand-alone entity or as a subcommittee of the current HSNO Committee).

244. Guidance documents that would be required to be developed include a guide for ABSCs on correctly assessing research proposals and a guide to control measures for (non-containment facility) laboratories. In response to any improvements that are needed to ABSC assessment reports, the EPA would likely provide assistance and advice to select

⁷⁷ Changes to implement the preferred options under Issue Six (Regulatory requirements for the use of eukaryotic somatic cells) and Issue Eight (Low-risk fermentation) would also be included with the risk-tiering framework.

ABSCs and/or add to the guidance document on the correct assessment of research proposals.

245. EPA will also need to develop new application documents for the new medicines application type and applications to accredit a biosafety committee.
246. Where a suspected unauthorised release of a new organism has occurred, where it relates to a (non-containment facility) laboratory, MPI enforcement officers will have the ability to investigate these facilities as specified under section 103 of the HSNO Act.
247. In order for this power to be available, a regulatory requirement will be added to the risk-tiering framework to specify that any facility that is being used for the purposes of undertaking research specified under Risk tier 1 must not be a 'dwelling'. The cost of these investigations to MPI will also be able to be recovered, as specified under section 97A of the HSNO Act.
248. MPI enforcement officers will also have the ability to issue compliance orders relating to any action that contravenes or is likely to contravene the HSNO Act. An offence under the HSNO Act would also be committed if a person 'knowingly imports or releases a new organism in contravention of this Act.'
249. In order to disincentivise the release of GMOs into the environment, a provision could be added to the HSNO Act (or relevant secondary legislation) to specify that the enforcement agency/a biosecurity inspector may prohibit any person from being given a biosecurity clearance, either:
- Until a compliance order issued to that person is no longer required, or
 - For a period of time specified by the enforcement agency, if in the opinion of the enforcement agency this prohibition is required to ensure there is no contravention of the HSNO Act by that person.

Timing for changes coming into effect

250. A bill to implement any agreed to changes could be introduced to Parliament in the first half of 2024. The secondary legislation and details for the proposed risk-tiering framework could be developed from when final Cabinet decisions are made and during the bill's passage through Parliament. As such, any regulatory changes agreed to as part of this policy work could come into effect at the start of 2025 (dependent on progress through Parliament).
251. Changes to the regulatory status of certain biotechnology (Issue Seven) would be made through additions to the *Hazardous Substances and New Organisms (Organisms Not Genetically Modified) Regulations 1998*. Following Cabinet agreement, drafting of these additions could be made by PCO and made through an Order in Council. These changes could be done in parallel with drafting for primary legislation changes.
252. As with work on the proposed risk-tiering framework, work on making changes to standards, either specific or broad, could be initiated once Cabinet decisions are made. These changes would not require regulatory amendments, either to primary or secondary legislation, though amendments would likely be made to any secondary regulations that reference these standards (as with the Low-Risk Genetic Modification regulations).
253. Consultation on the details of the risk-tiering framework would be conducted following Royal Assent of the bill to make primary changes to the legislation (should the bill be passed by Parliament).

Stakeholder involvement

254. As part of the development of the proposed risk-tiering framework outlined under Issue One, MfE in collaboration with the EPA will publicly consult on details of the risk tiers (as noted in paragraph 209).
255. As proposed in options 1 and 2 under Issue Nine (Standard for containment facilities), industry stakeholders could be involved in the development of guidance documents, along with MPI.
256. As part of the first consultation on these proposals, MfE will consult hapū, iwi and Māori on what regulatory requirements they would consider appropriate for the genetic modification of the cells and tissues of taonga species, use of genetic material from taonga species and Māori, and consent prior to the genetic modification of cells and tissues from Māori. Consultation with hapū, iwi and Māori will be an integral part of the second consultation on the details of the risk-tiering framework to ensure those regulations sufficiently address the wishes of those hapū, iwi and Māori.

Stakeholder notification

257. Individuals and organisations that will be affected by these changes will be notified through emails, press releases and relevant EPA newsletters. Emails will be sent to all individuals and organisations that provided submissions to our consultation.
258. As now, the EPA will provide advice to individuals and organisations on how they can comply with the new changes. Guidance documents will also serve as a means of communicating the changes and new obligations to individuals, organisations and businesses.

How will the new arrangements be monitored, evaluated, and reviewed?

259. No specific timeframe for evaluating or reviewing the data outlined below (paragraphs 216 to 228) has been set, though with the proposed change to require reviews of the regulatory settings every five years, a review of the data during the first five yearly review would be fitting.

Issue One

260. To determine the effectiveness of the proposed risk-tiering framework, several types of data will be used. These include the number of accredited biosafety committees (ABSC), the number of assessments completed by these ABSCs and the EPA's biosafety committee, the number of imports into (non-containment facility) laboratories and containment facilities, and whether there have been investigations required of (non-containment facility) laboratories.
261. The number of import applications into (non-containment facility) laboratories and containment facilities after changes are implemented could be compared to the number of import applications into containment facilities. An increase in the number of import applications would likely indicate that the changes made had encouraged more research to be undertaken.
262. The number of assessments completed by ABSCs and the EPA's biosafety committee could also be compared to the number of development applications assessed by the EPA prior to changes coming into force. This would also likely indicate that the changes made had encouraged more research to be undertaken.
263. Investigations required of (non-containment facility) laboratories would also likely indicate that either guidance for Risk Tier 1 need to be updated or applicants need to be

more sufficiently made aware of their legal obligations under the HSNO Act (ie, for GMOs to not be inadvertently released into the environment).

Issue Two

264. To determine the effectiveness of the proposed changes for medicines that are or contain new organisms, data will be collected on the number of applications to the EPA and the number of applications to Medsafe that previously would have needed EPA approval.

265. An increase in the total number of applications to the EPA combined with the number of applications to Medsafe that previously would have needed EPA approval, compared to the number before changes were made, would likely indicate that the changes made had encouraged more biomedical applications to be made. The number of applications to Medsafe that previously would have needed EPA approval, combined with an estimate of the time required for an EPA application, would also help determine the benefits from the changes.

Issues Three to Five

266. To evaluate and monitor the effectiveness of changes to standards (record-keeping, audit frequency and transfers), data on non-compliances will be used. These will include:

- the number of non-compliances that involve new organisms in containment facilities (excluding zoo animals)
- the level of non-compliance (minor, moderate, major)
- the type of organisms they involved (GMOs or non-GMO new organisms)
- whether the non-compliances were likely the result of lower requirements for record-keeping and internal audit frequencies.

267. In comparison with previous years (from data collected by MPI), this data would indicate whether the changes have resulted in a greater number of non-compliances.

Issue Six

268. Since the preferred option under Issue Six would place eukaryotic somatic cells under the risk-tiering framework, it would be unlikely that the effectiveness of this change, separate from the changes under Issue One, could be determined.

269.

Issue Seven

270. The effectiveness of this change would be unlikely to be ascertained due to these technologies already being unregulated (meaning that data is not readily available on their use in research in New Zealand). However, an assessment on whether the drafting of their exemption has resulted in unintended deregulation could be undertaken after a sufficient amount of time (as noted as a risk under paragraphs 134 and 135). This would enable MfE to ascertain whether amendments are required to the exemptions for these technologies.

Issue Eight

271. To evaluate the effectiveness of the changes to low-risk fermentation approval requirements, data will be collected and reviewed on the number of fermentation assessment reports completed by ABSCs, and the number of spills that have occurred (and whether these were sufficiently contained).

272. This data could be compared to data on the number of fermentation approvals made by the EPA before changes were made. Increases in the number of assessment reports

compared to EPA approvals would likely indicate that the changes made had encouraged more fermentation to be undertaken. Spills being adequately contained would indicate that the controls approved by ABSCs have been sufficient (and the converse if spills were not contained).

Appendix 1: New Zealand Research Community Engagement

Following the direction of the Minister for the Environment, in October 2021 MfE reached out to universities, research institutes, and biotechnology companies in New Zealand that were likely to be conducting research using GMOs. The purpose of this engagement was to establish how these groups experienced working with the current GMO regulations and to identify any issues with those regulations, especially those affecting biomedical R&D.

Researchers and groups could submit a completed survey to MfE and/or could organise a time to speak with MfE about their experience of working with the current GMO regulations. Twenty-four responses were received representing the views of over 32 individual researchers or laboratory managers from 11 universities, research institutes and biotechnology companies. Responses were received from Professors, Associate Professors, researchers at Crown Research Institutes, biosafety/compliance managers, senior lecturers, and Principal Investigators.

The survey questions were:

Name

Organisation

What research do you conduct?

What genetically modified organisms, including human cells, do you commonly use for your research?

Are there any technologies, techniques or organisms that in your opinion are regulated to an unnecessary degree by the genetic modification provisions of the HSNO Act?

What HSNO approvals do you commonly require, or have previously required, for your research? For example, importing into containment, development in containment, containment, release of a qualifying organism.

How do you find the application process for those approvals? Are there any aspects of the application process that you find particularly frustrating or unnecessary?

Do you find the application documents clear and the information requirements easy to understand? How do you find the level of information required for approval?

Do the regulatory requirements of the HSNO Act increase the administrative or financial resources that you require for your research, compared to what you might consider appropriate to manage risk? And if so, how much would you estimate this increase to be?

Please add any additional comments here.