Digital regulatory infrastructure and rules as code in New Zealand

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Overview

- Welcome and housekeeping
- About us
- Our approach (MIT report)
- An example
- DocRef and Syncopate tools
- Immediate opportunities for better digital regulatory systems

21 November 2024

tom@syncopatelab.com

Housekeeping

- Recording this session
- Distributing these slides
- Send questions to tom@syncopatelab.com
- Orientation toward New Zealand for today

Tom Barraclough

- Law and public policy (10+ years)
- Litigation and dispute resolution
- Think tank and public interest legal research
- Tech policy and regulation
- Clients in public and private sector, domestic and international
- Work outside, inside and alongside government

Hamish Fraser

- Software development and implementation (20+ years)
- Verb (software company)
- Local government
- Central government
- Service Innovation Lab
- Rules as code training and development
- Work outside, inside and alongside government

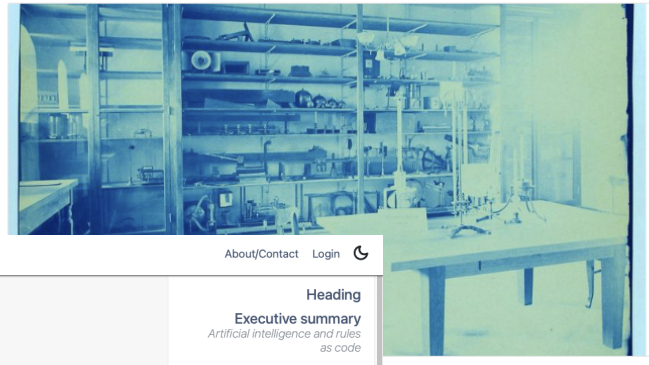
Big picture themes

- Regulation of digital systems (social media, AI, digital identity)
- Hierarchy of regulatory instruments (legislation, regulations, codes of practice, guidelines, technical standards)
- Digital systems essential for creating, implementing and complying with regulation (rules as code)
- Treat law and regulation as if paper-based
- Better integration is unavoidable and essential

Computational Law

@ law.MIT.edu

Generative AI for Law - Special Release Part 2



Governing Digital Legal Systems: Insights on Artificial Intelligence and Rules as Code

by Hamish Fraser and Tom Barraclough

Published: Oct 15, 2024

This article explores how AI and 'rules as code' are turning law into automated systems. It highlights the need for governance focused on transparency, explainability, and risk management to ensure these digital legal frameworks stay reliable and fair.

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Governing Digital Legal Systems: Insights on Artificial Intelligence and Rules as Code 2024

Version: 1 Date: 2024-10-15 Source: link

Governing Digital Legal Systems: Insights on Artificial Intelligence and Rules as Code

Hamish Fraser, Tom Barraclough

Executive summary

Artificial intelligence and rules as code

AI systems

1. The world is swamped with activity on artificial intelligence. In particular, a number of governmental and commercial operators are examining how artificial intelligence can be deployed in legal and regulatory contexts.
2. This more recent activity comes at a time when guidance, principles, best practice and other forms of soft regulation have already been established. These are now crystallising into binding legislation as well as other forms of harder regulatory restriction.

Rules as code

3. More modestly, another approach to automated systems is catching the attention of commercial, academic and governmental audiences, known as "rules as code". Rules as code is a label given to a deliberate approach to converting law and other forms of regulation into computer code and other digital formats. This enables law to be read by and operationalised in digital systems. Three key use cases for rules as code include:
   (a) **Deployment in automated decision-making systems.** Systems can receive data inputs representing key facts, apply algorithmic rules to that data in ways that approximate the law, and produce outputs that indicate how the law applies to that given set of facts. Deployment of rules as code in this way permits clear explanations for how the

Governing digital legal systems

Insights on artificial intelligence and rules as code

Hamish Fraser and Tom Barraclough

June 2024

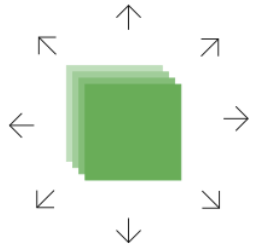

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Table 3. Reporting requirements for level 1 Rules.

Rule Number	Parameter	Compliance period	Reporting period[8]
T1.8	*E. coli*, total coliforms	3 Months	6 Months
T1.8	Turbidity	3 Months	6 Months
D1.1	*E. coli*, total coliforms	3 Months	6 Months

Table 4. Reporting requirements for level 2 rules.

Rule Number	Parameter	Compliance period	Reporting period[9]
T2.2	*E. coli*, total coliforms	1 Month	3 Months
T2.9	Turbidity	1 Month	3 Months
T2.13	UV dose	1 Month	3 Months
T2.18	FAC	1 Month	3 Months
T2.19	pH	1 Month	3 Months
D2.1	*E. coli*, total coliforms	1 Month	3 Months
D2.5	FAC	1 Month	3 Months

Table 5. Bacterial reporting requirements for level 3 Rules.

Rule[10]	Parameter	Compliance Period	Reporting period[11]
If chlorine is the primary disinfectant			
T3.2	Chlorine C.t	1 Day	1 Month
If chlorine dioxide is the primary disinfectant			
T3.8	Chlorine dioxide C.t	1 Day	1 Month
If ozone is the primary disinfectant			
T3.13	Ozone residual	1 Day	1 Month
If UV is the primary disinfectant			
T3.17	UV dose	1 Day	1 Month

[8] Report must be provided to Taumata Arowai within 20 working days of the end of June and end of December.

[9] Report must be provided to Taumata Arowai within 20 working days of the end of each quarter.

[10] Reporting is only required against one of the rules in this column depending on whether chlorine, ozone or UV is used as the primary disinfectant.

[11] Report must be provided to Taumata Arowai within 10 working days of the end of each month.

List of tables

Water Services (Drinking Water Standards for New Zealand) Regulations 2022

Rt Hon Dame Helen Winkelmann, Administrator of the Government

Order in Council

Table 2
Maximum acceptable values for inorganic determinands

Determinand	Maximum acceptable value (mg/L unless otherwise stated)	Notes
Aluminium	1	
Antimony	0.02	
Arsenic	0.01	
Barium	1.5	
Boron	2.4	
Bromate	0.01	
Cadmium	0.004	
Chlorate	0.8	
Chlorine	5	Expressed in mg/L as Cl_2
Chlorite	0.8	
Chromium	0.05	Total chromium content
Copper	2	
Cyanide	0.6	
Cyanogen chloride	0.4	
Fluoride	1.5	
Lead	0.01	
Manganese	0.4	
Mercury	0.007	Inorganic mercury only
Monochloramine	3	Expressed in mg/L as Cl_2
Nickel	0.08	
Nitrate, short-term	50	Expressed in mg/L as NO_3, or 11.3 mg/L as NO_3-N
Nitrite, short-term	3	Expressed in mg/L as NO_2
Nitrate and nitrite	Σ ratio < 1	The sum of the ratio of the concentrations of nitrate and nitrite to each of their respective MAVs must not exceed 1
Perchlorate	0.08	
Selenium	0.04	
Uranium	0.03	

ID	Rule Module	Rule Number	Level	Parameter Determinand ID	Type	Log	Compliance Period	Reporting Period	Report Timeframe	Sampling Frequency	Duration Between Samples	Determinand Check	Unit Check	Sample Reporting	Report Supply Level	Minimum Buildings	Rule Applies
G1	G	G1	0		Assurance	N/A	Annually	Annually	40 Working Days	N/A	N/A	0	0	1	1		S1,T1,D1
G2	G	G2	0		Assurance	N/A	Annually	Annually	40 Working Days	N/A	N/A	0	0	1	1		S2,T2,D2
G3	G	G3	0		Assurance	N/A	Annually	Annually	40 Working Days	N/A	N/A	0	0	1	1		S3,T3,D3
G4	G	G4	0		Assurance	N/A	Annually	Annually	40 Working Days	N/A	N/A	0	0	1	1		S1,S2,S3,T1,T2,T3,D1,D2,D3
G5	G	G5	0		Assurance	N/A	Annually	Annually	40 Working Days	N/A	N/A	0	0	1	1		S2,T2,D2,S3,T3,D3
G6	G	G6	0		Assurance	N/A	Annually	Annually	40 Working Days	N/A	N/A	0	0	1	1		S1,S2,S3,T1,T2,T3,D1,D2,D3,WC,TDWS
G7	G	G7	0		Assurance	N/A	Annually	Annually	40 Working Days	N/A	N/A	0	0	1	1		S1,S2,S3,T1,T2,T3,D1,D2,D3,WC,TDWS
G8	G	G8	0		Assurance	N/A	Annually	Annually	40 Working Days	N/A	N/A	0	0	1	1		S1,S2,S3,T1,T2,T3,D1,D2,D3,WC,TDWS
G9	G	G9	0		Assurance	N/A	Annually	Annually	40 Working Days	N/A	N/A	0	0	1	1		S1,S2,S3,T1,T2,T3,D1,D2,D3,WC,TDWS
G10	G	G10	0		Assurance	N/A	Annually	Annually	40 Working Days	N/A	N/A	0	0	1	1		S1,S2,S3,T1,T2,T3,D1,D2,D3,WC,TDWS
G11	G	G11	0		Assurance	N/A	Annually	Annually	40 Working Days	N/A	N/A	0	0	1	1		S1,S2,S3,T1,T2,T3,D1,D2,D3,WC,TDWS
G12	G	G12	0		Assurance	N/A	Annually	Annually	40 Working Days	N/A	N/A	0	0	1	1		S1,S2,S3,T1,T2,T3,D1,D2,D3,WC,TDWS
G13	G	G13	0		Assurance	N/A	Annually	Annually	40 Working Days	N/A	N/A	0	0	1	0		T1,T2,T3
G14	G	G14	0		Assurance	N/A	Annually	Annually	40 Working Days	N/A	N/A	0	0	1	0		T3,D3
G15	G	G15	0		Assurance	N/A	Annually	Annually	40 Working Days	N/A	N/A	0	0	1	0		S2,S3,D2,D3
G16	G	G16	0		Assurance	N/A	Annually	Annually	40 Working Days	N/A	N/A	0	0	1	0		D2,D3
G17	G	G17	0		Assurance	N/A	Annually	Annually	40 Working Days	N/A	N/A	0	0	1	0		T3,D3
VSC.1-ecol	VSC	VSC.1	0	ecol	Monitoring	N/A	Annually	Not Reported	N/A	Every 6 Months	At least 5 Months	1	1		1		VSC
VSC.1-coli	VSC	VSC.1	0	coli	Monitoring	N/A	Annually	Not Reported	N/A	Every 6 Months	At least 5 Months	1	1		1		VSC
VSC.2	VSC	VSC.2	0		Assurance	N/A	Annually	Not Reported	N/A	N/A	N/A	0	0		1		VSC
VSC.3	VSC	VSC.3	0		Assurance	N/A	Annually	Not Reported	N/A	N/A	N/A	0	0		1		VSC
S1.1-ecol	S1	S1.1	1	ecol	Monitoring	N/A	N/A	Annually	40 Working Days	Every 3 Months	N/A	1	1	2	0		S1
S1.1-coli	S1	S1.1	1	coli	Monitoring	N/A	N/A	Annually	40 Working Days	Every 3 Months	N/A	1	1	2	0		S1
S1.1-arse	S1	S1.1	1	arse	Monitoring	N/A	N/A	Annually	40 Working Days	Every 3 Years	N/A	1	1	2	0		S1
S1.1-boro	S1	S1.1	1	boro	Monitoring	N/A	N/A	Annually	40 Working Days	Every 3 Years	N/A	1	1	2	0		S1
S1.1-nitr	S1	S1.1	1	nitr	Monitoring	N/A	N/A	Annually	40 Working Days	Every 3 Years	N/A	1	1	2	0		S1
S1.1-iron	S1	S1.1	1	iron	Monitoring	N/A	N/A	Annually	40 Working Days	Every 3 Years	N/A	1	1	2	0		S1
S1.1-mang	S1	S1.1	1	mang	Monitoring	N/A	N/A	Annually	40 Working Days	Every 3 Years	N/A	1	1	2	0		S1
S1.2-ecol	S1	S1.2	1	ecol	Monitoring	N/A	N/A	Annually	40 Working Days	Every 3 Months	N/A	1	1	2	0		S1
S1.2-coli	S1	S1.2	1	coli	Monitoring	N/A	N/A	Annually	40 Working Days	Every 3 Months	N/A	1	1	2	0		S1
S1.2-cadm	S1	S1.2	1	cadm	Monitoring	N/A	N/A	Annually	40 Working Days	Every 3 Years	N/A	1	1	2	0		S1
S1.2-copp	S1	S1.2	1	copp	Monitoring	N/A	N/A	Annually	40 Working Days	Every 3 Years	N/A	1	1	2	0		S1
S1.2-zinc	S1	S1.2	1	zinc	Monitoring	N/A	N/A	Annually	40 Working Days	Every 3 Years	N/A	1	1	2	0		S1
S1.2-lead	S1	S1.2	1	lead	Monitoring	N/A	N/A	Annually	40 Working Days	Every 3 Years	N/A	1	1	2	0		S1
S1.2-benz	S1	S1.2	1	benz	Monitoring	N/A	N/A	Annually	40 Working Days	Every 3 Years	N/A	1	1	2	0		S1
S1.3	S1	S1.3	1		Assurance	N/A	Annually	Not Reported	N/A	N/A	N/A	0	0		0		S1
S1.4	S1	S1.4	1		Assurance	N/A	Annually	Not Reported	N/A	N/A	N/A	0	0		0		S1
S1.5	S1	S1.5	1		Assurance	N/A	Annually	Not Reported	N/A	N/A	N/A	0	0		0		S1
S2.1-ecol	S2	S2.1	2	ecol	Monitoring	N/A	N/A	Annually	40 Working Days	Monthly	N/A	1	1	2	0		S2
S2.1-coli	S2	S2.1	2	coli	Monitoring	N/A	N/A	Annually	40 Working Days	Monthly	N/A	1	1	2	0		S2
S2.1-ph	S2	S2.1	2	ph	Monitoring	N/A	N/A	Annually	40 Working Days	Every 6 Months	N/A	1	1	2	0		S2
S2.1-turb	S2	S2.1	2	turb	Monitoring	N/A	N/A	Annually	40 Working Days	Every 6 Months	N/A	1	1	2	0		S2
S2.1-iron	S2	S2.1	2	iron	Monitoring	N/A	N/A	Annually	40 Working Days	Annually	N/A	1	1	2	0		S2
S2.1-mang	S2	S2.1	2	mang	Monitoring	N/A	N/A	Annually	40 Working Days	Annually	N/A	1	1	2	0		S2
S2.1-nitr	S2	S2.1	2	nitr	Monitoring	N/A	N/A	Annually	40 Working Days	Annually	N/A	1	1	2	0		S2
S2.1-arse	S2	S2.1	2	arse	Monitoring	N/A	N/A	Annually	40 Working Days	Every 3 Years	N/A	1	1	2	0		S2
S2.1-boro	S2	S2.1	2	boro	Monitoring	N/A	N/A	Annually	40 Working Days	Every 3 Years	N/A	1	1	2	0		S2
S2.2-ecol	S2	S2.2	2	ecol	Monitoring	N/A	N/A	Annually	40 Working Days	Monthly	N/A	1	1	2	0		S2
S2.2-coli	S2	S2.2	2	coli	Monitoring	N/A	N/A	Annually	40 Working Days	Monthly	N/A	1	1	2	0		S2
S2.2-cadm	S2	S2.2	2	cadm	Monitoring	N/A	N/A	Annually	40 Working Days	Every 3 Years	N/A	1	1	2	0		S2
S2.2-copp	S2	S2.2	2	copp	Monitoring	N/A	N/A	Annually	40 Working Days	Every 3 Years	N/A	1	1	2	0		S2

Home (Datasets)
Rule Builder
Dataset Guides
Reporting Rules
Parameters and Determinands

Rule Builder

Supplier Type

- Very Small Communities — Up to 25 people, or up to 50 people for up to 60 days in any 12 month period.
- Networked Supplies
- **Self-supplied Buildings** (selected)
- Community Drinking Water Stations — Any population size
- Water Carrier Supplies — Any population size
- Water Carrier Services — Any population size
- Temporary Drinking Water Supplies — Any population size

Component Level

- Level 1 — Small (26 – 100 people)
- **Level 2** — Medium (101 – 500 people) (selected)
- Level 3 — Large (>500 people)

- [x] Varying Population
  For periods when the population exceeds 500 people.
- [x] S3 elect for compliance
- [ ] T3 elect for compliance
- [ ] More than one building
  Self-supplied Buildings providing water to more than one building - refer DWQAR Footnote 23.

Rule Modules

G + S3 + T2 + VP

Home (Datasets)

Rule Builder

Dataset Guides

Reporting Rules

Parameters and Determinands

Rule Modules

G + S3 + T2 + VP

Reporting Rules

Group reporting rules by:

View rules by modules
Pertaining to whole supply

Supply component
Per supply component

Filter reporting rules by:

Applicable rules
All applicable

Reported Rules
Requiring reporting

Reported Assurance Rules
Reported Assurance rules

Supply

Supply SQL

```
SELECT ID, Type, `Rule Module`, `Parameter Determinand ID`, `Reporting Period` FROM summary_list WHERE `Reporting Period` <> "Not Reported" and `Minimum Buildings` != "2" and `Report Supply Level` = "1" and (`Rule Applies` like '%Supply%'
```

Source

S3 SQL

```
SELECT ID, Type, `Rule Module`, `Parameter Determinand ID`, `Reporting Period` FROM summary_list WHERE `Reporting Period` <> "Not Reported" and `Minimum Buildings` != "2" and `Report Supply Level` != "1" and (`Rule Applies` like '%S3%') and
```

Treatment

T2 SQL

```
SELECT ID, Type, `Rule Module`, `Parameter Determinand ID`, `Reporting Period` FROM summary_list WHERE `Reporting Period` <> "Not Reported" and `Minimum Buildings` != "2" and `Report Supply Level` != "1" and (`Rule Applies` like '%T2%') and
```

Annually

G2 ↗

G3 ↗

G4 ↗

Annually

G15 ↗

S3.1 ↗

S3.2 ↗

3 Months

T2.2

T2.9

T2.13

S3.3C-ph

This page displays information extracted automatically from the authoritative "summary list" document published by Taumata Arowai. It sets out in three tables:

1. the reporting requirements for all suppliers reporting against reporting line `S3.3C-ph`,
2. the sampling obligations and frequency for any compliance reporting with that rule,
3. the relevant parameter/determinand with MAVs for the samples taken as drawn directly from the Drinking Water Standards Regulations (2022) or the DWQAR itself.

It also includes an Example Report and a References Table indicating where the summary list information was derived from.

Attributes

This table tells you the reporting requirements for this rule, including whether reporting is required, what must be reported, and how frequently.

Required	✓
Type	Continuous Monitoring
Determinand	pH
Compliance Period	N/A
Reporting Period	Annually
Reporting Timeframe	40 Working Days
Samples	No samples expected (1)

Parameter/Determinand

ID	ph
Name	pH
Type	Parameter
Source	DWQAR
Accepted Units	
Notes	

Example Report

No samples expected (1)


```
{
  "rule_id": "S3.3C-ph",
  "complies_with_rule": true,
  "non_compliant_periods": 0,
  "supply_component_id": "TP00000",
  "notes": "This can be left blank...",
  "samples": null
}
```

Digital legal systems

Takeaways

- Multiple sources of law and regulation
- Various digital outputs, traceable to legal source
- Potential to optimise legal sources for digital analysis
- Significant potential for direct digital implementation
- Huge potential for regulatory reporting systems across multiple domains

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Deploy documents as digital infrastructure

- Digital publishing
- Pinpoint links and references
- Enhanced cross-links between documents
- Export to multiple formats, publish to multiple locations
- Digital knowledge assets for public or private use

- API integrations
- Annotation and tagging
- Collaboration
- Versioning and change-tracking
- Full white-label presentation and visual design
- Handover and data portability

Immediate opportunity #1

Secondary legislation publishing

- Secondary Legislation Access Standards
- Publish as accessible HTML with pinpoint links
- Publish versions, amendments and tracked changes
- Collaborate, annotate, interlink
- Full white label and visual design/presentation
- Automated notices and export to other formats

Immediate opportunity #2

Consultation on drafts

- Publish consultation draft with tags and annotations
- Submitters annotate and tag, collaborate
- Submission received as dataset or spreadsheet
- Publish submissions as annotations

Immediate opportunity #3

Cross-agency or transnational regulation

- Regulation from multiple jurisdictions
- Regulation at different hierarchies (legislation, standards, guidance, codes)
- Data protection legislation across multiple jurisdictions
- Regulatory materials administered by multiple agencies
- Inter-linking and cross-referencing

Immediate opportunity #4

Rules as code pilots and POC

- Develop a traceable digital legal system with our support and tools
- Design, drafting, review or implementation phase
- Tightly constrained example in real world setting
- Automation without AI and LLMs

Immediate opportunity #5

Knowledge assets and stewardship

- Ministry of Regulation quick guides and regulatory stewardship
- Shared knowledge assets
- Benefits for engagement, communication, consultation, compliance and enforcement
- Systematic approach using digital regulatory infrastructure

Summing up

Better digital regulation is inevitable

Regulatory documentation can and must be improved (SLAS)

Digital implementation of law will be transformative

We're ready to work on projects now

Exciting user-facing products like DocRef available to purchase in the new year