



**Environmental
Protection Authority**
Te Mana Rauhi Taiao

FRCaST – operation instructions

Screening and prioritisation of chemicals for review

October 2018

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Contents

FRCaST operating instructions	1
FRCaST’s structure and information flow	1
Structure of FRCaST	1
Information flow within FRCaST	1
Running FRCaST	2
Adding data into FRCaST (worksheet ‘0_Inputs’)	2
Availability.....	3
Hazard criteria	3
Identification of modifying criteria	3
Identification of use scenarios and Exposure Factors.....	4
Recording processing comments and excluding lines from outputs	4
Calculation of Hazard Factors (worksheet ‘HazardCalcs’)	4
Human Health Hazard Factors (H _{HH})	4
Environmental Hazard Factors (H _E)	5
Calculation of Modifier Multiplier	5
Calculation of Risk Scores (worksheet ‘ExposureCalcs’)	5
Calculation of component Risk Scores	5
Calculation of Scenario Risk Scores	6
Screening categorisation (worksheet ‘1_Outputs’)	7
Calculation of modified Risk Scores.....	7
Assignment to Priority Groups.....	7
Graphical outputs	7
Summary of screening results (worksheet ‘PGnumbers’)	7

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FRCaST operating instructions

1. Hazards and exposure are qualitatively analysed in FRCaST (Flexible Reassessment Categorisation Screening Tool) in order to determine numerical scores for hazard and exposure, in order to calculate a risk score.
2. This document should be read in conjunction with the FRCaST Support Notes, which provides details on the screening process and basis of FRCaST. This document is intended to provide a comprehensive set of instructions to allow screening of chemicals to be undertaken, with minimal discussion on the rationale of approach taken.
3. Actions required by the operator are indicated by the lightning bolt symbol: 

FRCaST's structure and information flow

Structure of FRCaST

4. FRCaST is an Excel spreadsheet tool. There are several worksheets in the tool that require operator inputs (green-coloured tabs) and several worksheets that are for reference or audit control purposes (orange-coloured tabs; see Table 1).

Table 1 FRCaST worksheets

Worksheet order #	Worksheet category			Worksheet purpose
	Operator input required	Automated calculations	For reference/ audit only	
1			UpdateLog	Provides details of updates to FRCaST
2	0_Inputs			Input sheet for screening
3		HazardCalcs		Hazard scoring calculations
4		ExposureCalcs		Exposure scoring calculations
5	1_Outputs			Risk scoring and grouping; graphical display filters
6		PGnumbers		Summary of population of Priority Groups
7		BarChart		Graphical display of screening outputs (bar chart)
8		Radar		Graphical display of screening outputs (radar chart)
9			Look-up	Look-up reference tables for other worksheets

Information flow within FRCaST

5. Figure 1 shows the interrelationship of the various worksheets within FRCaST in terms of the flow of data between the different worksheets.

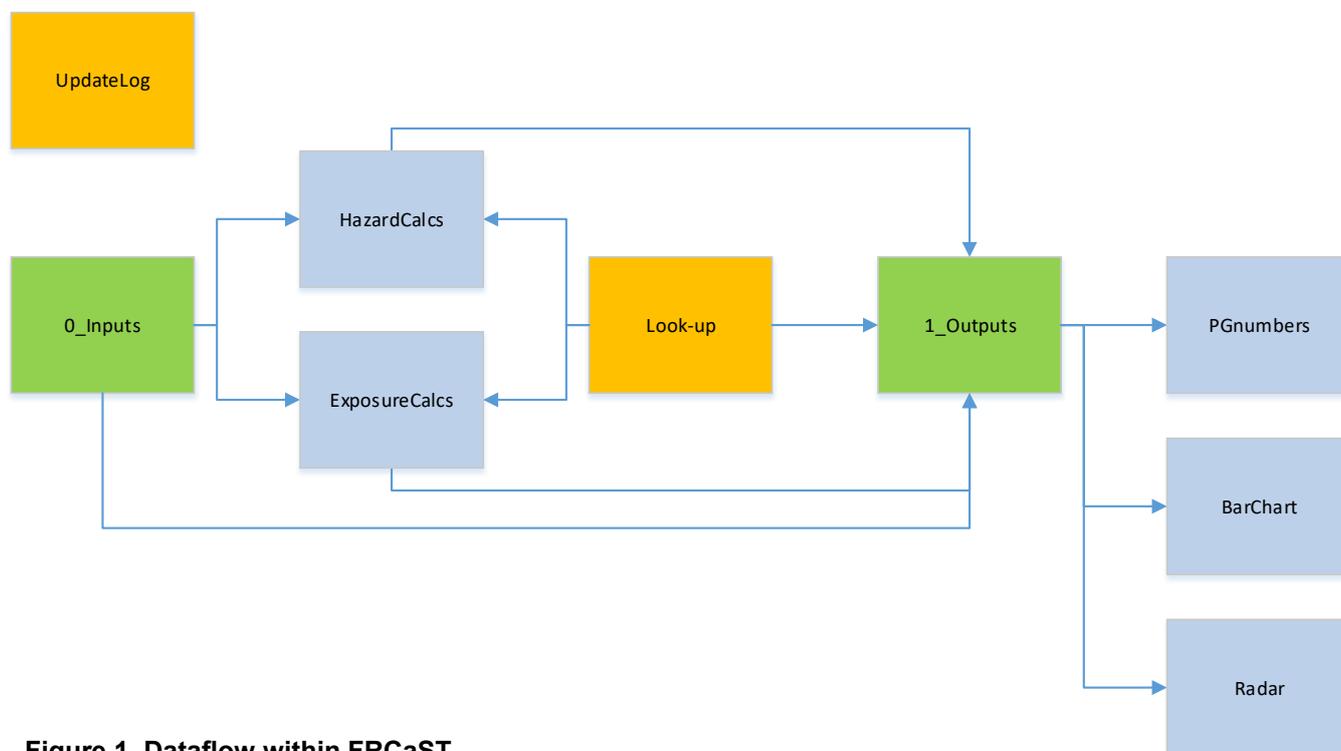


Figure 1. Dataflow within FRCaST

6. To run FRCaST, user input is only required on two worksheets: '0_Inputs' and '1_Outputs'

Running FRCaST

7. FRCaST is written using formulas and consequently, calculations are automatic, ie the outputs are updated following additions or amendments and present the live results. This means that testing can be carried out, varying numbers to see the effect. However, it also means that outputs are not locked and can be changed if modifications (intended or inadvertent) are made. Consequently, care must be taken to ensure that existing data is not unintentionally modified. It is preferable to create new line entries and exclude existing line entries from the output list, rather than overwrite existing line entries.

Adding data into FRCaST (worksheet '0_Inputs')

8. All input data required to run FRCaST is added into worksheet '0_Inputs'.

9. This worksheet is the starting point for the qualitative scoring. The base data for each chemical screened is provided in a single line in this worksheet. It is important that no filters are applied to the existing data.



10. Type or paste the name of the chemical to be screened into column B, in the next free cell.

-  11. In column A, type a corresponding line number. This is for ordering and tracking purposes. It is highly recommended that line numbers are in ascending order as this will provide a way to sort the data back to its original form.
-  12. Type or paste the chemical's CAS number into column C. This is for reference use only.
-  13. In column D, select the use type of the chemical from the dropdown list. This value does not impact on any other data within the screening tool, but can be used for sorting purposes. Where a chemical has multiple uses, choose the most appropriate.

Availability

-  14. In column E, enter whether the substance is on the New Zealand Inventory of Chemicals (NZIoC)¹. This indicates whether a chemical may be used in products covered by group standards.
-  15. Record the number of unique (unrevoked) HSNO approvals in column F. EPA staff can use the internal database to do these. Anyone outside the EPA looking to replicate this step can use the databases on the EPA website².
-  16. Using the Agricultural Compounds and Veterinary Medicine (ACVM) register on the Ministry of Primary Industries website³ record the number of ACVM registered products in column G.
17. In the absence of sales and volume data, a rough proxy of the level of availability and use of products can be provided by the number of HSNO approvals and the number of ACVM registrations where relevant.
Note: at this time, columns E, F and G are used to record information only and are not linked to other parts of FRCaST.

Hazard criteria

-  18. FRCaST calculates hazard scores automatically based on information in worksheet '0_Inputs'.
-  19. In column H, enter the Hazardous Substances and New Organisms (HSNO) hazard classifications for the substance. This should be obtained from the EPA's database in the first instance, supplemented with other information suggesting significant classification changes⁴. Copy the classification string from the Classification Summary page from the EPA's database (or Hazard Classification section on the 'Approved hazardous substances with controls' database⁵), supplemented with any classifications obtained from other sources (such as the ECHA and NICNAS databases).
-  20. In columns I to R, populate the cells with appropriate ecotoxicological data. Cells may be left blank.

Identification of modifying criteria

21. Four modifying criteria have been identified for use in FRCaST: persistence, bioaccumulation, endocrine disruption and domestic use/availability. Each modifier can augment the initial risk score by 10%, representing a maximum modification multiplier of 1.4 (+40%)⁶.

¹ <https://www.epa.govt.nz/database-search/new-zealand-inventory-of-chemicals-nzioc/>

² <https://www.epa.govt.nz/database-search/>

³ <https://eatsafe.nzfsa.govt.nz/web/public/acvm-register>. This regulatory register lists agricultural products and veterinary medicines currently registered in New Zealand.

⁴ Relevant information may be sourced from data from overseas regulatory organisations, including ECHA, EFSA, NICNAS, APVMA, US EPA, Environment and Climate Change Canada

⁵ <https://www.epa.govt.nz/database-search/approved-hazardous-substances-with-controls/>

⁶ FRCaST can accommodate additional modifying factors and includes columns for Persistent Organic Pollutant (POP) properties, as well as volatility and groundwater transport. The individual modifiers can be switched on and off using the toggles in cells S2 to Y2, noting that altering the toggles will affect all substances so should not be changed without analysis.

22. Evidence of domestic use or availability in New Zealand (eg availability from supermarkets or common DIY retailers) should be noted. Information held by the EPA, supplemented by searches of known domestic use product manufacturer websites and retailers, as well as any available reports by overseas regulatory organisations, gives a reasonable indication of the use of substances by domestic and non-professional users.

23. Information on persistence, bioaccumulation and endocrine disruption may be held in the EPA's database, and should be verified/supplemented with findings of other chemical regulators (eg regulatory organisations in Australia, Europe and North America).

 24. For each of the modifying properties, select Yes or No from the dropdown lists in columns S to V.

Identification of use scenarios and Exposure Factors

25. Each distinct use scenario of a chemical is identified and assigned an Exposure Factor. This information is held in columns Z to AK for scenarios associated with use in or around dwellings, and columns AL to AY for scenarios associated with commercial and industrial uses, ie non-dwelling related.

 26. For each scenario in which a substance is used, select an Exposure Factor (from 1 to 5) from the dropdown list that best represents the level of exposure associated with that use pattern.

27. Selecting an appropriate Exposure Factor relates, in large part, to the degree of containment / dispersion of the chemical through its use, with considerations of the guidance information provided in FRCaST Support Notes; see Table 3 'Indicative descriptions of Exposure Factors'.

 28. If none of the pre-populated use scenarios are appropriate, then there are two additional columns that can be used: one for 'other' dwelling-related uses and one for 'other' non-dwelling-related uses (columns AK and AY respectively). If the latter is selected, then it is essential that columns AZ and BA are completed also. These columns will act as manually added Balance Factors; defining the balance between human health and environmental exposures. If these columns are not filled out a Risk Score of 0 will be carried through for that scenario. Input the Balance Factor for Human Health into column AZ. The Environmental Balance Factor in column BA will automatically populate so that the sum of the two balance factors is equal to 2.

Recording processing comments and excluding lines from outputs

 29. Any processing comments (including explanatory arguments and justifications) should be captured in column BB.

 30. Column BC is used for reference and auditing purposes only.

 31. Add a comment into column BD if you want to exclude a particular line from the FRCaST outputs. If you want a chemical to appear in the FRCaST outputs, leave this cell blank.

Calculation of Hazard Factors (worksheet 'HazardCalcs')

32. This worksheet is automatically populated and requires no user input.

Human Health Hazard Factors (H_{HH})

33. Columns A, B and C are copied automatically from worksheet '0_Inputs' columns A, B and H respectively. Using look-up data held in worksheet 'Look-up', the classification string in column C is analysed:

- Column D returns 'TRUE' if any category 1 classifications are present in column C.
- Column E returns 'TRUE' if any category 2 classifications are present in column C.

- Column F returns 'TRUE' if any category 3 classifications are present in column C.
- Column G returns 'TRUE' if any category 4 classifications are present in column C.

34. Human Health Hazard Factors are presented in column H, determined based on the lowest hazard category triggering a "TRUE" response and assigned a numerical value between 1 and 5:

- Category 1 = Hazard Factor 5
- Category 2 = Hazard Factor 3
- Category 3 = Hazard Factor 2
- Category 4 = Hazard Factor 1.

Environmental Hazard Factors (H_E)

35. Ecotoxicity data is automatically copied into columns K to T from worksheet '0_Inputs', columns I to R.

36. These values are compared to data held in worksheet 'Look-up' and accordingly assigned a score between 2 and 5 (presented in columns U to AD). The Environmental Hazard Factor (column AE) is determined using the maximum value from columns U to AD.

Calculation of Modifier Multiplier

37. Columns AF to AL are populated automatically by copying data from worksheet '0_Inputs' columns S to Y respectively. When the multiplier is switched on (worksheet '0_Inputs' cells S2 to Y2 = "YES" for the corresponding column), a 1 is reported in the corresponding worksheet 'HazardCalcs' column.

38. The Modifier Multiplier is calculated based on the values contained in columns AF to AL.

39. The overall Modifier Multiplier will be calculated and presented in worksheet 'HazardCalcs', column AM, as follows:

$$\text{Modifier Multiplier} = 1 + (0.1 \text{ for each modifying criteria present})$$

Calculation of Risk Scores (worksheet 'ExposureCalcs')

40. This worksheet is automatically populated and requires no user input.

41. Columns A and B are copied through from worksheet '0_Inputs'.

42. Column C presents the number of use scenarios selected in worksheet '0_Inputs'.

43. Columns D and E present data from worksheet 'HazardCalcs' columns H and AE respectively.

44. Columns F and G present data from worksheet '0_Inputs' columns AZ and BA respectively.

Calculation of component Risk Scores

45. Columns H to AG calculate the Human Health Risk Scores, taking the Human Health Hazard Factor (column D) and multiplying it by the scenario Exposure Factor (worksheet '0_Inputs' columns Z to AY) and the Human Health Balance Factor for the scenario (worksheet 'Look-up', column H, or, in the case of 'other non-dwelling' scenario worksheet 'ExposureCalcs' column F).

46. Similarly, columns AH to BG calculate the Environmental Risk Scores, taking the Environmental Hazard Factor (column E) and multiplying it by the scenario Exposure Factor (worksheet '0_Inputs' columns Z to AY)

and the Environmental Auto-Modifier value for the scenario (worksheet 'Look-up', column I, or, in the case of 'other non-dwelling' scenario worksheet 'ExposureCalcs' column G).

Calculation of Scenario Risk Scores

47. Columns BH to CG combine the Human Health Risk Score and Environmental Risk Score to give the Scenario Risk Score for each scenario.

48. Columns CH to CO present the maximum scenario scores for different criteria.

- Column CH: maximum dwelling-related Human Health Risk Score (ie the maximum score from columns H to S).
- Column CI: maximum dwelling-related Environmental Risk Score (ie the maximum score from columns AH to AS).
- Column CJ: maximum non-dwelling-related Human Health Risk Score (ie the maximum score from columns T to AG).
- Column CK: maximum non-dwelling-related Environmental Risk Score (ie the maximum score from columns AT to BG).
- Column CL: maximum Human Health Risk Score (ie the maximum score from columns CH and CJ).
- Column CM: maximum Environmental Risk Score (ie the maximum score from columns CI and CK).
- Column CN: maximum Scenario Risk Score (ie the maximum score from columns BH to CG).
- Column CO: total of the Scenario Risk Scores (ie the total score across all use scenarios from columns BH to CG).

Screening categorisation (worksheet '1_Outputs')

Calculation of modified Risk Scores

49. Worksheet '1_Outputs' presents the outputs of the screening, presenting unmodified Risk Scores, modified Risk Scores, as well as grouping results.

50. Column AB copies in data from worksheet '0_Input' column BD. This allows data to be filtered to remove line entries from the screening output.

51. Columns A, B and C are automatically copied through from worksheet '0_Inputs' columns A, B and C respectively.

52. Column D is copied through from worksheet 'HazardCalcs' column AM.

53. Unmodified Risk Scores, presented in columns E to L, are copied from worksheet 'ExposureCalcs' columns CH to CO respectively.

54. Modified Risk Scores, presented in columns M to T, are the products of the corresponding column (E to L) multiplied by the Modifier Multiplier (column D).

Assignment to Priority Groups

55. The modified Risk Scores in columns M to T are compared to threshold values in worksheet 'Look-up' columns AD to AH in order to assign a group (a to F, with A being the highest priority). The results of these comparisons are presented in columns U to AA.

56. At this time, the chemical's Priority Group is based on the Maximum Modified Scenario Risk Score (column AA). This represents the worst case scenario.

Graphical outputs

57. Columns AD to AF control the line entries that are shown on the output bar chart (worksheet 'BarChart') and radar plot (worksheet 'Radar').

- Column AD enables the graphical outputs to only consider valid line entries, ie those that have not been excluded for the reasons entered in '0_Input' column BD.
- Column AF identifies chemicals in Priority Group A or B.
- Column AE identified chemicals in Priority Groups A or B (based on column AE), or selected chemicals listed in a worksheet 'Look-up' column to be specified by the user.

 58. The charts on worksheets 'BarChart' and 'Radar' displays all line entries in the live view of worksheet '1_Output'. In order to change what is displayed, use the filters on columns AD, AE, and AF. Sorting of the displayed chemicals mirrors the order that is displayed on worksheet '1_Outputs'. The preferred sorting of the screening results is on column R (Maximum Modified Scenario Risk Score), from largest to smallest (ie high score to low score).

Summary of screening results (worksheet 'PGnumbers')

59. A summary of the number of chemicals in each categorisation group, including the Priority Groups, from the worksheet "1_Outputs" is automatically calculated and presented in the worksheet 'PGnumbers'.