

# FAQs and Responses on the Precautionary Matrix for Synthetic Nanomaterials

$$V = N \cdot (W \cdot E + S)$$

```

graph TD
    PE[Potential effect] --> PN[Precautionary need]
    U[Uncertainties] --> PN
    PHE[Potential human exposure] --> PN
    PIE[Potential input into the environment] --> PN
    
```

### Precautionary Matrix for Synthetic Nanomaterials

Schweizerische Eidgenossenschaft  
 Confédération suisse  
 Confederazione Svizzera  
 Confederaziun svizra

Bundesamt für Gesundheit BfG  
 Bundesamt für Umwelt BfU

**Entry according to EU-proposed definition**

Material consisting primary particles, in an unbound state or as an aggregate or as an agglomerate and where, for 50% or more of the primary particles in the number size distribution, one or more external dimensions is in the size range 1 nm - 100 nm or (if the number size distribution is unknown) Material where the specific surface area by volume is greater than 60 m<sup>2</sup>/cm<sup>3</sup> or Material consists of fullerenes, grapheme flakes or single wall nanotubes.

**Entry according to precautionary approach**

Material consisting primary particles with one or more external dimensions in the size range 1 nm - 500 nm

Decision steps:

- Does the nanomaterial form agglomerates >500nm?
  - Yes: Not nano-relevant\*
  - No: Proceed to next question.
- Could the agglomerates disintegrate Again in the body or environment?
  - Yes: Nano-relevant\*
  - No: Proceed to next question.
- Relevant for human health only (Not nano-relevant\* for the environment): Do agglomerates between 500nm and 5µm exist and could they be inhaled by employees or consumers?
  - Yes: Nano-relevant\*
  - No: Not nano-relevant\*

\* "Nano-relevant" means nano-relevant according to this matrix.

Version 3.0  
30 October 2013

FAQs	Responses
<p>What support is available for using the precautionary matrix, and where and how can I comment on the precautionary matrix and provide my own opinion?</p>	<p>For all questions or comments concerning the precautionary matrix and its use, the following persons are at your disposal:</p> <ul style="list-style-type: none"> <li>• Ch. Studer (FOPH), christoph.studer@bag.admin.ch</li> <li>• E. Furrer (FOEN) ernst.furrer@bafu.admin.ch</li> <li>• K. Schmid (SECO) kaspar.schmid@seco.admin.ch</li> <li>• J. Höck (TEMAS AG), juer-gen.hoeck@temas.ch.</li> </ul> <p>Additional information can be found on the InfoNano website: <a href="http://www.infonano.ch">http://www.infonano.ch</a></p> <p>Industry and trade associations are also willing to receive your questions and comments on the precautionary matrix.</p>
<p>Are nanoparticles dangerous?</p>	<p>In no way and with no conceivable tool can this question be flatly answered. Different answers result here from case to case; the same nanoparticle can have different effects, depending of environmental conditions.</p>
<p>What is the legal status of the precautionary matrix?</p>	<p>The matrix is non-binding and is used on a voluntary basis; no one has to justify the results. However, it can serve as a confirmation that planned processes or products have been examined in the context of prevention and existing scientific knowledge, and that applicable measures were introduced.</p>
<p>Is a digital version of the precautionary matrix available?</p>	<p>A digital version is now available on the Infonano website. It facilitates the filling in of the precautionary matrix which saves time.</p>
<p>How much effort is required to complete a precautionary matrix?</p>	<p>Experience has shown that once the relevant data are available and have been prepared, it takes between 1 and 2 hours to complete the matrix for the first time with the help of the digital version. In order to modify the various scenarios, each of the other process or application steps take only minutes to assess.</p>

FAQs	Responses
Can the precautionary matrix also be completed by non-specialists?	Non-specialists can only use the precautionary matrix with the assistance of specialists, as a certain basic knowledge is required in order to correctly assess the parameters. Likewise, contacts to experts are sometimes necessary in order to answer specific questions. The precautionary matrix has to have this scientific level, as in the absence of a scientific background it would be unable to produce any exploitable assertions. The same applies to the interpretation of completed precautionary matrices.
Is the matrix based on scientific fundamentals?	The parameters from the precautionary matrix are based on scientific considerations and intensive collaboration with pertinent experts. Should the state of scientific knowledge change then the parameters will also be adjusted accordingly.
Can examples of completed precautionary matrices be obtained?	Such examples are not available, as in the absence of the relevant context and the required introduction, they could be misunderstood and consequently have little value.
In the context of the precautionary matrix, what are “synthetic nanomaterials”?	The scope is described in the precautionary matrix by two approaches: The first approach is based on the EU proposed definition 2011/696/EU. In the second precautionary approach, primary particles up to an average particle size of 500 nm are also included. Nanostructured materials or fine particulate matter are excluded.
What does nano-relevance mean?	Nano-relevance in the context of the precautionary matrix refers to the presence of nanomaterials that correspond to one of the two abovementioned defining approaches.

FAQs	Responses
What is the meaning of "available information"?	The available information relates to the knowledge of the manufactured, further processed or disposed nanomaterial. Any knowledge gaps are associated with greater precautionary need since they involve additional uncertainty.
What exactly do "known" and "assessable" mean in the available information?	Each user must decide this themselves. If there is uncertainty about whether something is known and can be evaluated, it is recommended to answer the questions as if there were no available knowledge.
<p>What do the following two questions mean for primary manufacturers of nanomaterials?</p> <ul style="list-style-type: none"> <li>• Is the origin of the (nanoscale) starting materials known? (I1)</li> <li>• Is sufficient information available to complete the precautionary matrix for nanoscale starting materials? (I2)</li> </ul>	<p>These questions should be answered by the primary manufacturers of nanomaterials as follows:</p> <ul style="list-style-type: none"> <li>• I1: Answer the question for non-nanoscale starting materials</li> <li>• I2: If no nanoscale starting materials are present, the answer for this parameter should be 'yes'</li> </ul>
What does "precautionary need" mean and why is "risk" or "risk potential" not used?	The precautionary matrix does not determine risk in terms of a risk assessment, but rather only provides indications of where a need for action exists in order to clarify potential risks. A need for precautionary measures means that possible sources of risk should be clarified and if needed appropriate measures should be implemented.
What does "nanospecific" mean?	This term relates to properties of nanomaterials which result solely from their nanometric size, and which cannot be predicted from the properties of the bulk material.
What does the score (point counts) mean and what is their purpose?	The point counts used to classify the results of the matrix are based on a mathematical formula. They represent an arbitrary classification on a scale in order to facilitate the analysis of risk potentials and the comparison of different scenarios.
What does "potential exposure of humans" mean?	This does not mean the actual exposure, but the maximum possible exposure (worst case) of a human, taking into account the quantity and availability of the nanomaterials being handled.
What does the question on coatings / functionalisation mean?	For coated or functionalised nanomaterials it is important to decide whether these nanomaterials are stable or continue to exist in a different form and must therefore be treated in a further precautionary matrix.

FAQs	Responses
A single molecule is not a synthetically manufactured nanomaterial, but what about compounds of 10 or 100 molecules?	With this and other borderline cases, it should be noted that when using the precautionary matrix one is not concerned with the exact definition of “nano”, but more about determining whether a possible nanospecific need for action exists. With this in mind, in case of doubt the use of the precautionary matrix for a giant molecule or agglomerates of single molecules is not wrong.
Can the precautionary matrix be used for fine particulate matter?	The precautionary matrix was not designed for use with fine particulate matter. However, here as well, the use of the matrix is not inappropriate as long as all required data are available.
How should e.g. a colour pigment mixture be treated, which consists of several nano-relevant compounds?	The precautionary matrix can be used as long as these individual pigments have homogeneous properties in the context of the parameters of the precautionary matrix. Otherwise each nanomaterial has to be evaluated independently.
How should mixtures of various nanomaterials be treated when the properties of the mixtures do not correspond to the sum of the individual properties of the nanomaterials, i.e. in the presence of synergistic effects?	These “cocktail effects” are not taken into account by the precautionary matrix.
Is the use of the precautionary matrix binding to anything?	The precautionary matrix is voluntary and is conceived only as a tool to provide support.
Is there a list of possible measures for the precautionary matrix?	The precautionary matrix is not used as a catalogue for possible measures, but rather for early assessments, namely when identifying handling requirements. The choice of measures is on a case-by-case basis and therefore does not appear in the context of the precautionary matrix.
Is there a labelling obligation that depends on the classification given by the precautionary matrix, or is one planned?	Such a labelling obligation based on two classes is not meaningful, as the information content is insufficient as a basis for taking a purchasing decision.

FAQs	Responses
Does a poor classification mean proscription?	Absolutely not! Moreover, the classification means neither a danger nor an absolute risk. It simply indicates the level of need for clarification. The classification is particularly suitable for a relative comparison of two or more scenarios; the point counts do not have any absolute meaning <i>per se</i> .
Am I allowed to publish my results?	Every user is free to publish his results. However, the use of the results to lead someone to believe in a possibly non-existent product safety (e.g. with a label “precautionary matrix class A”) is not welcomed. This does not correspond to the sense and the spirit of the precautionary matrix that, with its results, triggers deeper evaluations and should not itself be seen as a risk-assessment tool.
How can the potential effect be evaluated in the absence of more detailed data?	The assessment should be in comparison with already evaluated nanomaterials. An exemplary list of comparative materials is integrated in the Guidelines on the Precautionary Matrix.
If someone only relies on the achieved point score, then this can result in ambiguous information that can be highly counterproductive when published. How is this tackled?	This difficulty will always arise, no matter how a tool of the precautionary matrix type is designed. This cannot be avoided even by adapting the precautionary matrix. Consequently, specific measures will be taken in order to prevent misinterpretations (information brochures, training courses, dialogues...)
Can the precautionary matrix be meaningfully used as a supplement to the safety data sheet?	Yes. At present, there is no form for indicating nanospecific information. The important data required by the precautionary matrix can however be voluntarily indicated. Likewise they can be requested together with the SDS from industry and commerce, when needed. NB: a guide for nanospecific supplements to existing SDSs is presented in the introduction.
Will the precautionary matrix take into consideration any misuse of products by workers or consumers?	Misuse is not included in the precautionary matrix.
Can consumers also use the precautionary matrix?	In principle, anyone with sufficient data and understanding can use it. Indeed, the precautionary matrix has been designed for use by industry, trade and commerce. Following the evaluation, these users should assess the precautionary need and communicate appropriate protective measures.

FAQs	Responses
Is it foreseen that the precautionary matrix will also be used outside Switzerland?	Use of the precautionary matrix is not limited to Switzerland; a cross-border exchange of information and experience is, on the contrary, even explicitly welcomed and in the meantime has already occurred to a considerable extent.
I obtain my nanomaterials from foreign suppliers; in spite of this can I still use the precautionary matrix?	The precautionary matrix is not explicitly limited to Switzerland. It can be used everywhere, where a precautionary need should be evaluated. The parameters in the precautionary matrix are set up such that no in-house secrets are requested. Therefore, it is also possible to request a foreign supplier to supply the required material parameters.
Isn't the precautionary matrix a Swiss solo initiative?	No, similarly pragmatic tools also exist in other countries. A solo effort, however, is not envisaged; international cooperation is under way and is intended to be continued.
Has the practical suitability of the precautionary matrix been tested?	The precautionary matrix has been tested for its practical suitability and revised accordingly in a trial phase, in which about 80 predominantly industrial users participated.
Will the precautionary matrix be updated on a regular basis?	The matrix will be reviewed and adjusted as needed and after feedback has been received.
Is standard literature available to evaluate the precautionary matrix and select appropriate measures?	No. The precautionary matrix and its evaluation must be examined on a case-by-case basis, i.e. based on specific issues. A list of standard literature sources for all these different cases is not available.
A high score in the classification can arise both as a result of a lack of knowledge as well as by poor actual scores. Is a distinction made here in the precautionary matrix?	No. Users evaluate this point in the precautionary matrix themselves. Analysing poor knowledge is part of the process suggested by the precautionary matrix.
Why is material toxicity not used as an evaluation criterion?	The precautionary matrix is based on important modes of action which are used for deriving the effect potential. The modes of toxic action can lead to toxic effects.
How can deliberately incorrect completion of the precautionary matrix be prevented?	It cannot be prevented at all. Each user is responsible for completing this tool correctly. Since its use is voluntary, users will not gain any advantage or disadvantage by completing it incorrectly.
In what languages is the precautionary matrix available?	The precautionary matrix is available in German, French, Italian and English.
What are the target groups of the precautionary matrix?	The target groups are stakeholders who are responsible for the safety of employees, consumers or the environment (industry, trade, commerce, government authorities, insurers, etc.)

FAQs	Responses
<p>What are the key messages of the precautionary matrix?</p>	<p>The precautionary matrix delivers the following key messages:</p> <ul style="list-style-type: none"> <li>• The precautionary principle must and can be applied to synthetic nanomaterials</li> <li>• Differentiation is necessary when considering the safety and risks (for employees, consumers and the environment)</li> <li>• Not all nanomaterials are the same: Case-by-case differentiation of scenarios depending on the conditions of use or the surrounding conditions</li> <li>• Voluntary measures by the responsible parties ("causers") are needed, but should be supported by non-bureaucratic assistance</li> <li>• The precautionary matrix provides such support, but is integrated in a larger context (the action plan)</li> <li>• The precautionary matrix produces a rough preliminary decision and uniform basis for discussions of the need for more extensive investigations</li> </ul>
<p>What does environmental assessment by the precautionary matrix actually involve?</p>	<p>The assessment of precautionary environmental need is much more generic than the health assessment. No new matrix parameters that would improve this situation can currently be defined. For the on-going support of users, a fact sheet has therefore been produced to explain the interpretation of results and the need for considering compartments and material flows. It also includes links to information materials and experts.</p>
<p>Why isn't a matrix made available that is specifically tailored to the environment?</p>	<p>We don't want to remove the environmental part from the precautionary matrix, especially as the topic is closely linked with human health aspects.</p>
<p>In comparison with health the survey for the environment is very generic. On this basis is an assessment and classification into classes A and B at all sensible?</p>	<p>In the context of an initial selection this classification is definitely sensible; a note on the generic character of the evaluation will be reported. A further explanation for a meaningful evaluation of the matrix for the environmental field is provided in the bulletin "The significance of the precautionary matrix for synthetic nanomaterials for the environment".</p>
<p>Is the approach to nanomaterials in the environment really already relevant in regard to the quantities involved?</p>	<p>Based on the market volumes, the input quantities can already be substantial and are increasing. In the context of an early envisage of potential future problems, the environment must without doubt be already included.</p>



FAQs	Responses
What is the best way of disposing of nanomaterials so that they do not end up in the environment?	Information and guidance on the disposal of industrial and commercial waste has been prepared by the FOEN working group "Environmentally compatible and safe disposal of nanomaterial waste". Contact: FOEN, Sektion Industriechemikalien, Dr Ernst Furrer (ernst.furrer@bafu.admin.ch)
What exactly is the meaning of "environmental conditions"?	The approach for assessing a certain scenario with the precautionary matrix is always based on limiting the actual generic conditions to a quite specific case. This means that also in the environment, the assessment of a specific nanomaterial must always be carried out in direct regard to its environmental conditions. These conditions depend on the chosen scenario: biotic or abiotic environment, different compartments, different environmental conditions, different types and amounts of nanomaterials.
The potential effect is strongly directed to health. Is it at all appropriate for the environment?	Yes, the effect potential is based on important modes of action and is applicable to all organisms. An important difference lies between the stabilities of the nanomaterials in the respective environment and the human body.
In the environment shouldn't particles that are larger than 500 nm also be considered as potentially environmentally relevant?	No. Consideration to a maximum of up to 500 nm is applicable for all organisms. The uptake of larger particles is unlikely.
What does the stability of the nanomaterial mean exactly when considering the different possible environmental compartments? Are hours/days - weeks/months not too short?	The stability for the environmental compartments has the same significance as for health. It is certainly sensible to use the same classification for the biotic part of the environment as for human health. For the abiotic environment the given time frames are if anything short; however in the context of precaution this is advantageous.
Is there a basis for the quantitative limit of 500 kg/year for the environmental assessment?	<p>The limit is based on the following model consideration: On the basis of the TiO<sub>2</sub> example, a PNEC of 1 µg/l is assumed. For an estimated use of 200 l per day for each inhabitant of Switzerland (ca. 8 million), the annual volume is considered to be 500x10<sup>9</sup> l. This, together with the accepted PNEC, results in an annual limit of 500 kg, below which no effect occurs.</p> <p>This projection is very general and set at a high level for Switzerland as a whole. It should be pointed out that locally strongly different quantitative scenarios are possible. This is not however considered in the scope of the precautionary matrix. This projection will be re-evaluated and adapted according to new findings.</p>

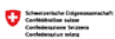
## Contacts

FOPH Dr Christoph Studer, Chemicals Division  
Tel. +41 (0) 31 323 86 66, christoph.studer@bag.admin.ch

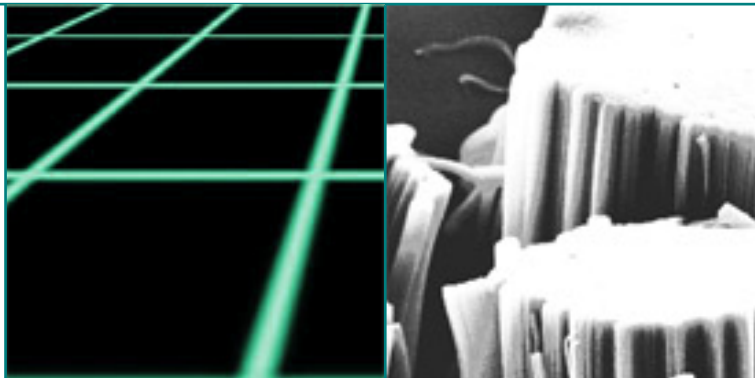
FOEN Dr Ernst Furrer, Air pollution control and Chemicals Division  
Tel. +41 (0) 31 325 38 10, ernst.furrer@bafu.admin.ch

TEMAS AG Dr Jürgen Höck, Development concept of the Precautionary Matrix,  
Tel. 071 446 50 30, juergen.hoeck@temas.ch

Precautionary Matrix for  
Synthetic Nanomaterials



Bundesamt für Gesundheit BAG  
Bundesamt für Umwelt BAFU



30 October 2013