1,1,1-Trichloroethane is rapidly absorbed from the lungs and gastrointestinal tract, but only small amounts—about 6% in humans and 3% in experimental animals—are metabolized. Exposure to high concentrations can lead to hepatic steatosis (fatty liver) in both humans and laboratory animals. In a well-conducted oral study in mice and rats, effects included reduced liver weight and changes in the kidney consistent with hyaline droplet neuropathy. IARC has placed 1,1,1-trichloroethane in Group 3. 1,1,1-Trichloroethane does not appear to be mutagenic.

A health-based value of 2 mg/l can be calculated for 1,1,1-trichloroethane on the basis of a TDI of 0.6 mg/kg body weight, based on changes in the kidney that were consistent with hyaline droplet nephropathy observed in a 13-week oral study in male rats, and taking into account the short duration of the study. However, because 1,1,1-trichloroethane occurs at concentrations well below those of health concern, it is not considered necessary to derive a formal guideline value.

Trichloroethene

Trichloroethene (TCE) is used primarily in metal degreasing. However, its use has been substantially declining since the 1990s as a result of increased environmental regulations on TCE emissions. It is emitted mainly to the atmosphere, but it may also be introduced into groundwater and, to a lesser extent, surface water in industrial effluents. Poor handling and improper disposal of TCE in landfills have been the main causes of water contamination. Higher levels of TCE are expected in groundwater than in surface water because of the lack of volatilization that occurs from groundwater. Therefore, the most relevant routes of exposure are considered inhalation of contaminated air and ingestion of contaminated drinking-water, particularly from groundwater sources.

Guideline value	0.008 mg/l (8 µg/l)
Occurrence	Typically present at low or undetectable concentrations in surface water (≤1 µg/l) due to high volatility and continued decline in TCE production. Concentrations may be higher (usually below 100 µg/l) in groundwater systems where volatilization and biodegradation are limited.
TDI	0.5 µg/kg bw, based on the TDI values derived from three key studies showing decreased thymus weight in female mice, increased incidence of developmental immunotoxicity in mice and increased incidence of fetal cardiac malformations in rats. The narrow range of TDIs among the three key studies was further supported by two other studies in rats evidencing renal effects. Where applicable, uncertainty factors were applied to the points of departure from each of the three studies to account for interspecies differences, intraspecies variation and use of a LOAEL instead of a NOAEL.
Limit of detection	0.01 µg/l by GC with ECD after liquid–liquid extraction; 0.01–3.0 µg/l by purge-and-trap capillary GC with PD or with PD and ECD in series; and 0.5 µg/l by purge-and-trap capillary GC-MS

Prevention and treatment	Source control is by improved handling and disposal practices. Treatment of surface water sources is not needed because TCE volatilizes to the atmosphere. For groundwater sources, aeration (packed tower aeration and air stripping) and GAC are effective central treatment techonologies. Ozone and advanced oxidation processes may also be effective.
Guideline value derivation	
• allocation to water	50% of TDI
• weight	60 kg adult
• consumption	2 litres/day
Additional comments	The guideline value is considered protective against both cancer and noncancer effects.
	In developing national standards, authorities may take into consideration the additional exposures through the dermal and inhalation routes from showering and bathing, especially in countries with low rates of ventilation in houses.
	Requirements for monitoring TCE in drinking-water regulations and standards should be limited to groundwater sources where a possibility of TCE contamination is indicated. Monitoring is not needed for surface water sources because TCE volatilizes to the atmosphere.
Assessment date	2020
Principal reference	WHO (2020) *Trichloroethene in drinking-water*

Available human and animal data after repeated exposure to TCE identify the kidney, liver, immune system, male reproductive system and developing fetus as potential targets of TCE toxicity and/or carcinogenicity. IARC has classified TCE as carcinogenic to humans (Group 1), concluding that sufficient epidemiological data are available for an association between exposure to TCE and human kidney cancer. Associations reported for liver cancer and non-Hodgkin lymphoma are characterized as limited, and evidence for other tumours is classified as inadequate. Multiple points of departure from different studies, rather than a single key study, were included in the derivation of the TDI. The overall TDI is based on three key studies with TDIs ranging from 0.3 to 0.6 µg/kg bw per day, and supported by other two studies in rats. Critical effects include increased incidence of heart malformations in rats (TDI of 0.6 µg/kg bw per day), decreased thymus weights in mice (TDI of 0.6 µg/kg bw per day) and developmental immunotoxicity (TDI of 0.37 µg/kg bw per day). The further supporting data in the database include studies reporting toxic nephropathy in rats (TDI of 0.3 µg/kg bw per day) and increased kidney weight in rats (TDI of 0.8 µg/kg bw per day by using route-to-route extrapolation from the inhalation study). Whenever possible, benchmark dose modelling and physiologically based pharmacokinetic modelling (to account for first-pass effects and inhalation-to-ingestion extrapolation) were applied.

Trifluralin

Trifluralin (CAS No. 1582-09-8) is a pre-emergence herbicide used in a number of crops. It has low water solubility and a high affinity for soil. However, biodegradation