National legislation, standards and recommendations with respect to water risk management and Legionella prevention

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Abstract

In this article, risk management and Legionella prevention is discussed from a practice-oriented point of view, which can be assigned to Facility Management in healthcare (FM in HC). Water systems in facilities contaminated with Legionella is a serious issue of hygienic risk which needs to be addressed and not only of economic threat or image loss to a facility. Managers, such as operators or any other duty holders, can be responsible for building-associated facilities (water systems). This paper collects, extracts and discusses FM-relevant duties. It emphasizes important issues with relevance to risk management. First, a tabulated collection of statutes, standards and other documents guiding for design, operation and maintenance to minimise risks caused by Legionella in building (drinking) water systems is presented. This is followed by well-discussed situations reported from practice in the national context of Germany. The topic of Legionella prevention of water systems is not limited to a national context. Differences exist according to legislation and to explanations of generally accepted engineering standards, i.e. norms, recommendations, or technical and guidance documents. For the people responsible, who may be assigned to the professional field of FM, there are undeniably aspects of water hygiene that could enforce criminal and civil law obligations. The results of this context-specific paper may provide support in detecting deficiencies and thus avoid potential lawsuits.

Keywords: Facility Management, Risk Management, Legionella, Water System

1. Introduction

The scope of Legionella in water systems in HC settings provides a clear link to FM and prevention, which can be regarded as part of an organisation's risk management (Freije, 2005; Gamage et al., 2016; Hübner et al., 2011; Spagnolo et al., 2013; Völker et al., 2016). Legionellae are causative agents of Legionnaires' disease (LD), an atypical form of pneumonia and potentially fatal (Fields et al., 2002). Apart from the challenges of historically grown building structures and changing infrastructure, hygiene-related issues are perceived and to be discussed from different perspectives (Borella et al., 2004; Hock & Martin, 2013; Kool et al., 1999; Reis et al., 2015; van Heijnsbergen et al., 2015).

Water systems in facilities contaminated with Legionella is a serious issue of hygienic risk which needs to be addressed and not only of economic threat or image loss to a facility (BBC, 2013). Managers, such as operators or any other duty holders, can be responsible for building-associated facilities as for example drinking water systems (Hoebe & Kool, 2000). Not only classic microbiological topics play a role in the prevention process, but also activities in the building which are specific to the building and which are people-related (Freije, 2004). FM is built on decision-making. The maxim of the operating manager should be to identify and align "protective goals" of their own organization according to given regulations and the current state of the art (Hübner et al., 2011), which goes beyond or supplements statutory liabilities.

The topic of Legionella prevention of water systems is not limited to a national context. For the people responsible, who may be assigned to the professional field of FM, there are undeniably aspects of water hygiene that could enforce criminal and civil law obligations. Resulting from any reason imaginable in daily business routine of duty holders, there may be failure of determining appropriate risk reduction strategies to counteract Legionella (Gollnisch et al., 2003). This context-specific paper may provide support in detecting deficiencies and thus avoid potential lawsuits.

2. Methodology and approach (Materials and Methods)

This paper is a result of the study of journal papers, articles, standards, law and court decisions. The findings are separated in two ways. First, a tabulated collection of statutes, standards and other documents guiding for design, operation and maintenance to minimise risks caused by Legionella in building (drinking) water systems is shown. Second, well-discussed situations concerning the liability of duty holders with respect to Legionella risk management are presented. They comprise “sampling”, “independency” and “risk assessment/ hazard analysis” and argue from a legal perspective. Quotes taken from statutory documents are translated from German into English. A final section discusses cases reported from practice in the national context of Germany. They are evidenced by corresponding regulations.

3. Findings

3.1. Statutory and normative frame for the United Kingdom, Switzerland and Germany

Table 1: Relevant for the **United Kingdom**: Collection of statutes, standards and other documents guiding for design, operation and maintenance to minimise risks caused by *Legionella* in building (drinking) water systems.

	United Kingdom
Statutes / regulations	*Health and Safety at Work Act 1974* *Provision and Use of Work Equipment Regulations 1998 (PUWER)* *The Management of Health and Safety Regulations 1999* *Control of Substances Hazardous to Health Regulations 2013 (COSHH)* *The Construction Design and Management Regulations 2015 (CDM)*
Standards / Supporting guidance / best practice & other documents	*HSE ACoP L8* (Approved Code of Practice) *2013 Legionnaires' Disease-The Control of Legionella in Water Systems* *Legionnaires' Disease Technical Guidance HSG 274, parts 1, 2 and 3* HTM 04-01 (safe water in healthcare premises): *HTM 04-01 Part A: design, installation and commissioning* *HTM 04-01 Part A: operational management* *HTM 04-01 Part A: Pseudomonas aeruginosa – advice for augmented care units* *HTM 04-01 Part A: performance specification D 08 – thermostatic mixing valves (healthcare premises)* [it should be read in conjunction with the HSE's Approved Code of Practice (L8) and HSG274 Part 2. It is equally applicable to both new and existing sites] British Standard: *BS 8558:2015 Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages. Complementary guidance to BS EN 806* *BS 8580:2010 Sampling for Legionella bacteria in water systems* *BS 7592:2008 Water quality. Risk assessments for Legionella control. Code of Practice.* *CIBSE TM13-Minimising the risk of Legionnaires' Disease* BSRIA Guides: *BG 57/2015 Legionnaires' Disease – Risk Assessment* *BG 58/2015 Legionnaires' Disease – Operation and Maintenance Log Book* WMSoc Publications: *W043 Guide to Legionella Risk Assessment* *W044 Code of Practice Cooling Water* *W045 Legionnaires' Disease (Knowing your responsibilities & avoiding prosecution)*

	W046-1 to W046-9 Guidance for Managing Risks *W047 Keeping you Cooling Tower Safe*
Key points of *ACoP L8*	
Not complying with the ACoP can bring prosecution under health and safety legislation. Duty holders must carry out or initiate risk assessments. There is the requirement to ensure understanding of all rules concerning buildings or activities where water is used or stored and where there is a means of creating or transmitting water droplets or spray (aerosols) which may be inhaled by occupants. Noting of cross references to HSG274 parts 1, 2 and 3.	

Table 2: Relevant for **Switzerland**: Collection of statutes, standards and other documents guiding for design, operation and maintenance to minimise risks caused by *Legionella* in building (drinking) water systems.

	Switzerland
Statutes / regulations	*Bundesgesetz über Lebensmittel und Gebrauchsgegenstände Lebensmittelgesetz, LMG) vom 20. Juni 2014* *Lebensmittel- und Gebrauchsgegenständeverordnung (LGV) vom 16. Dezember 2016* *Verordnung über den nationalen Kontrollplan für die Lebensmittelkette und die Gebrauchsgegenstände (NKPV) vom 16. Dezember 2016* *Verordnung über den Vollzug der Lebensmittelgesetzgebung (LMVV) vom 16. Dezember 2016* *Verordnung über Trinkwasser sowie Wasser in öffentlich zugänglichen Bädern und Duschanlagen (TBDV)* *Hygieneverordnung (HyV)* *Wassergesetz des Kantons Zürich (legislative process by consultation)* Kantonale Verordnungen *Verordnung über allgemeine und Wohnhygiene (vom 20. März 1967)*
Standards / Supporting guidance / best practice & other documents	*W3d Richtlinie für Trinkwasserinstallationen (inkl. W3 Ergänzung 1+2)* *W4d Richtlinie für Wasserverteilung* *W3/E2d Richtlinie; Betrieb und Unterhalt von Sanitäranlagen* *W3/E1d Richtlinie; Rückflussverhinderung in Sanitäranlagen* *W1000d Empfehlung für die Reinigung und Desinfektion von Trinkwasserleitungen* *SIA Norm 385/9: Wasser und Wasseraufbereitungsanlagen in Gemeinschaftsbädern (gültig seit 1. Mai 2011)* *SIA Norm 385/1:2011 Anlagen für Trinkwarmwasser in Gebäuden – Grundlagen und Anforderungen*

	SIA Norm 385/2:2015 Anlagen für Trinkwarmwasser in Gebäuden – Warmwasserbedarf, Gesamtanforderungen und Auslegung
Key points of SVGW	
SVGW guidelines are a measure of correct behaviour and may also be relevant in case of legal action	

Table 3: Relevant for **Germany**: Collection of statutes, standards and other documents guiding for design, operation and maintenance to minimise risks caused by *Legionella* in building (drinking) water systems.

	Germany
Statutes / regulations	*TrinkwV (BGBl, 2016)* *GefStoffV* *IfSG (IfSG, 2000)* *AVBWasserV* *ArbStättV*
Standards / Supporting guidance / best practice & other documents	*UBA Recommendations (UBA, 2006, 2012a, 2012b)* *Guideline for hospital hygiene and infection prevention (RKI, 2003)* *VDI/DVGW 6023 (VDI/DVGW, 2013)* *DVGW W551 (DVGW, 2004)* *DVGW W556(A) (DVGW, 2015)* *GEFMA 922 (GEFMA, 2004b)* *GEFMA 190 (GEFMA, 2004a)* *GEFMA 192 (GEFMA, 2013)* *DVGW W 1001 (H) DVGW W 1001 (H), Sicherheit in der Trinkwasserversorgung – Risikomanagement im Normalbetrieb* *DVGW W 270 (A)* *UBA KTW-Leitlinie, Leitlinie zur hygienischen Beurteilung von organischen Materialien in Kontakt mit Trinkwasser (KTW-Leitlinie)* *DIN CEN/TR 16355:2012-09* *DIN 1988-100; DIN 1988-200; DIN 1988-300; DIN 1988-500; DIN 1988-600; DIN 2000; DIN 18381; DIN EN 806-1; DIN EN 806-2; DIN EN 806-3; DIN EN 806-4; DIN EN 806-5; DIN EN 1717; DIN EN 16421; DIN EN ISO 19458*
Key points of TrinkwV and	

GEFMA 922-1B

TrinkwV (BGBl, 2016)
§ 14 Untersuchungspflichten:
(1) Kriterien Untersuchungspflicht.
(2) Umfang und Häufigkeit.
(3) Probennahmestellen und Probennahmen nach den allgemein anerkannten Regeln der Technik.
(6) Untersuchung durch Untersuchungsstellen, die nach § 15(4) zugelassen sind.

§ 15(3) Dokumentationspflicht.
§ 15(4) Die [...] Untersuchungen einschliesslich der Probennahmen dürfen nur von dafür zugelassenen Untersuchungsstellen durchgeführt werden. Hinweis auf Veröffentlichung der zugelassenen Untersuchungsstellen auf Landesliste § 15(5) Überprüfung der Untersuchungsstellen.

§ 16(7) Massnahmen bei Überschreitung des technischen Maßnahmenwertes.

§ 24 Straftaten und § 25 Ordnungswidrigkeiten: Hier sind alle Auflagen, gegen die verstoßen werden kann, einzeln aufgeführt.

GEFMA 922-1B (GEFMA, 2016)
Aufzeichnung(en) der Ergebnisse der vorgeschriebenen oder angeordneten Wasseruntersuchungen (Trinkwasser-Versorgungsanlagen). Source: TrinkwV 2001; § 15 Untersuchungsverfahren und Untersuchungsstellen; § 15 Abs. 3 Satz 1-3.

Aufzeichnung(en) über ergriffene Massnahmen zum Schutz der Gesundheit der Verbraucher (Trinkwasser-Versorgungsanlagen). Source: TrinkwV 2001; § 16 Besondere Anzeige- und Handlungspflichten; § 16 Abs. 7 Satz 3.

Betriebsbuch (Trinkwasser-Installation). Source: VDI/DVGW 6023; 3 Begriffe; 3 [9]; VDI/DVGW 6023; 8.2 Instandhaltungsplanung; 8.2 [7-8].

Gefährdungsanalyse (Trinkwasser-Installation). Source: TrinkwV 2001; § 16 Besondere Anzeige- und Handlungspflichten; § 16 Abs. 7 Satz 1 Nr. 2.

Instandhaltungsplan (Trinkwasser-Installation). VDI/DVGW 6023; 6.5 Betriebsanweisung, Instandhaltungs- und Hygieneplan; 6.5 [1, 6-7]; VDI/DVGW 6023; 8.2 Instandhaltungsplanung; 8.2 [5g].

Massnahmenplan (Trinkwasser-Installation). Source: TrinkwV 2001; § 16 Besondere Anzeige- und Handlungspflichten; § 16 Abs. 5

3.2. Documented situation of Legionella prevention in drinking water systems in buildings, argued from practice in Germany

3.2.1. Sampling

There are numerous service providers on the market who are not an investigating agency in the sense of § 15 (4) TrinkwV, but who carry out sampling measures as a service provider. The person in duty of the drinking water installation is therefore obliged to commission an accredited and approved laboratory for Legionella testing, according to §§ 15 TrinkwV. A passage that has not been noticed in its detail is derived from TrinkwV § 15 (4): It says that necessary testing, including the sampling, may only be carried out by authorized testing bodies. The complexity now results from further specifications:

1. The DVGW worksheet W 551 (DVGW, 2004), to be complied with in accordance with § 4 TrinkwV (DVGW, 2004), refers in each case to the valid version of the recommendation of the Federal Environmental Agency (UBA).

2. The recommendation of the UBA (UBA, 2012a) explains: "Sampling may only be carried out by laboratories accredited for drinking water testing."(UBA, 2012a). It also states that "external samplers must be involved in the quality assurance system of the laboratory (...).". It is further stated that "certification of the sampler alone does not meet the requirements of the Drinking Water Ordinance (TrinkwV). The responsibility for carrying out the sampling and sample transport (pre-analysis) remains exclusively with the laboratory management of the accredited laboratory." (UBA, 2012a).

For the so-called external samplers of laboratories, the specifications of the DAkkS (German accreditation agency, accreditors of the laboratories) must be observed. In the explanation of the DAkkS (71 SD 4 011) provided in (UBA, 2012a), it is stated, inter alia: "The external sampler must maintain confidentiality, i.e. in his function as a sampler for the investigating body he may not, without the permission of the investigating agency, forward collected data and information to third parties, in particular to colleagues or superiors of his organization." (DAkks, 2017).

One focus of the errors in microbiological analytics is the insufficient number of samples. It was found that large residential buildings were only examined by three samples, although a double-digit number of samples would have been necessary according to DVGW W 551 (DVGW, 2004). The evaluation of the water installation tested is carried out according to the "worst" sample, i.e. the highest level of contamination detected. In a UBA recommendation (UBA, 2006) it reads that an increase in Legionella is to be assumed especially if the generally accepted rules of technology are not taken into account during planning, construction and operation (see also §4 TrinkwV 2001)." (UBA, 2006).

Other very common and observed errors during sampling are listed below:

- no or completely inadequate testing, no follow-up testing
- testing of abandoned property (buildings / flats)
- testing of bodies not operated according to the intended purpose
- no sampling at documented places
- sampling according to "purpose C" of DIN EN ISO 19458
- sampling of incorrectly given sampling points (e.g. plastic / rubber hose)

3.2.2. Independency

A further focus is currently on the sampling and also the preparation of hazard analyses. The extent to which a quotation from the official document “Recommendation of the German Federal Environmental Agency” can be applied to the carrying out of hazard analyses (UBA, 2012b) analogously to sampling is shown in the case-law. As mentioned by the UBA Recommendation (UBA, 2012b), it is stated that "the conduct of the hazard analysis must be independent of other interests. In particular, a bias must be avoided. A bias is then to be suspected if persons were or are involved in the planning, construction or operation of the drinking water installation" (UBA, 2012b). The "independence" requirement for sampling also results from the accreditation standard DIN EN ISO / IEC 17025 for the inspection bodies
It is not uncommon for people who have planned, built or even operated the drinking water installations to be inspected to check their own work, but “Legionella testing is intended to show whether or not the drinking water installation to be examined is likely to lead to a preventable health hazard. It should be borne in mind that those involved in the drinking water installation (such as planners, installers, operators, etc.) can always be accused of an irrefutable "personal interest". For this reason, these groups of persons should always act in their own interest in such a way that they cannot be subject to the potential reproach of a bias. For entrepreneurs and other owners of drinking water installations (UsI) this aspect should therefore be a selection criterion to be considered” (UBA, 2012b).

3.2.3. Risk assessment / hazard analysis

If legionellae above 100 CFU / 100 ml have been detected in the laboratory, the technical action level is exceeded. In this case, the TrinkwV dictates a procedure to follow. In addition to further measures, § 16 (7) (BGBl, 2016) provides more detailed information with respect to this case. An critical focus in daily practice is the preparation of the hazard analysis required in § 16 (7) (BGBl, 2016). A recommendation from the UBA on the establishment of a hazard analysis (UBA, 2012b) is available free of charge on the internet pages of the UBA. It addresses the target group "entrepreneur or other owner of the drinking water installation (UsI)". As often

discussed in the daily work, the term "recommendation" has been issued. Obviously, the term "recommendation" is often interpreted as "optional". The TrinkwV § 16 (7) states: "In carrying out measures pursuant to sentence 1, points 2 and 3, the entrepreneur and the other owner must observe the recommendations of the environmental protection agency." (BGBl, 2016). For good order, it should be noted that the correct wording is: "Recommendation of the UBA after consulting the Drinking Water Commission". Those who fail to meet the requirements of an entire expert committee will find it hard to prove that they were "expertly better" than the expert committee.

In practice, the necessity for hazard analysis due to a contamination of 101 Legionella / 100 ml it is often criticized. However, it is overlooked that microbiology has peculiarities, inter alia that the focus of the contamination in the drinking water installation can be displaced as a function of several parameters and has not yet been determined in the course of the orientative testing. In the technical regulations (DVGW, 2004), there is the indication that in the course of the orientative testing, no concrete remedial measures can be derived, so that the extent of the contamination is always determined after exceeding the technical measure value.

The UBA's recommendation is that "the UsI is responsible: in case of claims for damages in court, it may be important to be able to prove the independence and sufficient qualification of an expert called in" (UBA, 2012b). It is in the interest of building administrators to pay particular attention to the reference from (UBA, 2012b).

A further focus is on the professional competence of the personnel who carry out hazard analyses, which requires professionals. It should be noted that the expert who conducts a hazard analysis is responsible for its implementation (rectification of defects). In other words, the identified deficiencies are all eliminated; the user can expect the drinking water installation to no longer exceed the technical value of the process.

3.2.4. Legal aspects

Regardless of the modifications made by the TrinkwV in the years 2011 to 2016, the substantive legal foundations have hardly changed. It is for that reason that reference can be made to them (Gollnisch, 2010). Apart from possible civil claims of victims, the owners and custodians of drinking water supply systems may find themselves liable under administrative or criminal law in case they should fail fulfilling their obligations given by the TrinkwV. For that, § 24 TrinkwV defines criminal offenses, which are based on §§ 74 (and following) of the Infection Protection Directive (IfSG, 2000).

Paragraph 25 subparagraph 4 TrinkwV provides that the owner of a drinking water installation

already commits a sanctionable administrative offense if testing envisaged in § 14 TrinkwV is not carried out, carried out incorrectly, incompletely or not in the prescribed manner.

According to legislative intent, it does not explicitly matter whether the duty holder of the drinking water installation did not undertake the testing or not did it as required, or whether the investigating body commissioned had made the mistake.

When the owner mandates a company not properly authorised to carry out testing, they also commit a sanctionable administrative offense because of a negligent selection. Details of meeting conformity are described in § 14 (6), 15 (4) TrinkwV. In other words, the proprietor is also legally responsible for the correct work of the laboratories they commission, in addition to the investigating staff of the laboratory. The extent to which this provision can actually be implemented in reality remains to be seen, since the holder of a drinking water installation must, of course, be able to rely on the company they choose providing a proper service.

For the owner and manager of property and care facilities, claims of civil rights are of far greater importance if they have not, or have not adequately, fulfilled the obligations of the TrinkwV. They then confront the risk of damages claims by the injured party, pursuant to §§ 249, 253, 280 of the German Civil Code (BGB) (BGB, 2002), since the TrinkwV is regarded as a protective act within the meaning of § 823 BGB (German Civil Code) (BGH, 1983).

The classification of TrinkwV as protection law within the meaning of section 823 of the German Civil Code (BGB) means that the owners and landlords are liable towards their contract partner not only by contract (e.g. a contract of tenancy or lodging). There is a non-contractual liability to third parties, too. This arises from the legal duty of the landowner to maintain safety. It means that the landowner has to provide for everything they can reasonably expect might happen, so that their property does not pose a threat to the life and health of third parties.

In this case, however, visitors to a tenant are also included in the scope of protection of § 823 BGB. According to the case law of the Federal Court of Justice (BGH), the legal duty to maintain safety is defined as follows: "The legally required duty to maintain safety covers those measures which a prudent and circumspect, reasonably cautious person considers necessary and sufficient to protect others from damage ..." (BGH, 2007).

The property owner's negligent violation of the legal duty to maintain safety is sufficient to trigger their liability for damages if appropriate measures are not implemented or not properly implemented. This is expressly stated in § 823 (1) BGB. With regard to the TrinkwV, it follows from this that the distribution of drinking water which does not comply with the requirements of the TrinkwV constitutes a breach of the legal duty to maintain safety by the property owner. This also includes the exceeding of the technical action level (technischer Massnahmenwert)

laid down in § 3, subparagraph 9 TrinkwV defined for Legionella in drinking water. This is explicitly the result of the testing listed in § 14 TrinkwV as well as the notification and action obligations of the landowner regulated in § 16 TrinkwV.

In the vast majority of cases, the owner and manager of land will not have the necessary expertise to meet the statutory requirements according to the legal duty to maintain safety imposed by the legal authority. They must manage the examinations being carried out according to §§ 14 (6); 15 (4) TrinkwV by a body authorized by the lawgiver. It is therefore the responsibility of the owner of the drinking water facility to select an approved company to commission the testing of the drinking water.

If the owner or manager of the property violates this duty, there is the risk that a victim can claim damages on the grounds of a negligent selection within the meaning of § 823 BGB. It is, therefore, in the ultimate interest of the land owner or landlord to carry out regular inspections of the drinking water system on a regular basis and thus to commission an authorized inspection body to remove their own liability for damages. The following remarks on the current jurisdiction are intended to illustrate that the above statements are not merely theory. There are now a number of judicial decisions which can be applied to other cases, and each with a different perspective:

Compensation for pain and suffering

The basis for the so-called non-material damage (referred to as "compensation for pain and suffering") is § 253 BGB (German Civil Code). However, a significant change has been made in the case of a possible claim for compensation by the injured party. In so far as an immaterial damage has been considered doubtful in the past, however, this can no longer be maintained with regard to current developments in the legal system (Gollnisch & Gollnisch, 2011; Gollnisch, 2010). The jurisprudence is now seen as solid. It also follows, however, that the owner or manager of land owes the injured party damages as well as compensation for pain and suffering: The following is an overview of the current state of jurisprudence:

(1) The LG Dortmund (LG, 2010) awarded compensation to a victim who had been infected with *Legionella* during a hospital stay in a doctor's office. An expert's report [ibid.] concluded that the cause was *Legionella* infection deficiencies in the heating and drinking water system. After the decision of the court, the building owner was convicted, not the commercial tenant.

(2) The Supreme Court (KG) (KG for the German term "Kammergericht") ruled on 8 December 2010 (KG, 2010) that a survivor of a victim who died of a legionellosis was awarded compensation of € 5,000. The injured party was in a nursing home and was suffering from legionellosis due to deficiencies in the drinking water system and died there later. According to

the KG, it was ultimately irrelevant whether or not the victim had died from legionellosis. The sole factor was that the nursing home owner had violated the obligation 'duty to maintain safety'. (3) For the first time, a decision of the Federal Supreme Court (BGH) is also available on this problem: The BGH (BGH, 2015) has ruled that a victim is entitled to a compensation payment for a *Legionella* infection. The injured party was a tenant in a multi-family house. Among other things, the landlord had, for at least 8 years, not controlled for *Legionella* in the drinking water system of the tenement house. An additional feature of the drinking water system was being disproportionally large. The tenant fell ill with a severe form of legionellosis and then died during the lawsuit. The statutory heir now makes claims against the landlord. However, the BGH also clarified that the tenant must prove the causality between the presence of *Legionella* in the drinking water system and the legionellosis (§ 286 ZPO (ZPO, 2005)). The tenant cannot make use of such proofs, such as in the physician liability process, for example (§ 287 ZPO).

4. Discussion

Selecting experts to conduct a hazard analysis in the sense of TrinkwV §16 (7) can prevent hazards to the health of the users of the drinking water installation or potentially even save lives. Furthermore, it can keep the client from committing a negligent selection. On the one hand there are tendencies of court decisions going towards *compensation for damages and loss as well as for pain and suffering* to the injured party or her heirs. On the other hand can be assumed that civil justice grants even higher pain compensation payments to injured parties. This argument is supported by the reason of a more detailed and tightened catalogue of demands in appendix 4, part II of the TrinkwV, which describes requirements for the owner or operator of a drinking water installation. It also defines checks for the presence of *Legionella* at regular intervals. This prognosis does not even take into account the fact that for many years now the tendency of the courts has been to award injured parties ever higher compensation payments. This fact should be considered carefully by duty holders, not only because of their liability in managing facilities.

5. Conclusion

Management should consider their scope of duties as part of a functioning risk management, irrespective of whether it is a public organisation, a business or private built environment. For all of these there are laws and duties defined by statutes, standards or practical guides for design, operation and maintenance to minimise risks. Those seen as most important and relevant at present from a practitioner’s perspective have been collected and highlighted for three selected

countries. A direct comparison of the content or rating of each national context is not part of this paper. A deeper insight into existing issues in practice in Germany gives evidence on the importance of the topic and complexity of managing correctly. In the national context of Germany, a precise picture on legislation, economic aspects, civil law, liability, risks of owners and landlords in terms of sanctioning has been presented. Keeping in mind this well-documented picture and underlying potential similarities of duties, gaps, risks and actions in their own country, it may be seen a reason, why a common process of *Legionella* prevention in water systems in hospitals has not been described to date.

For the healthcare sector, it may be most evident that there is a general "by profession"-given closeness to topics concerning hygiene, especially in the recognition and awareness of topics of a certain field (i.e. *Legionella* prevention) which refers to the spectre of healthcare-associated infections (HAI), an thus, risk management. By considering the topic of water hygiene there is a variety of stakeholders working on a common process of *Legionella* prevention (Gamage et al., 2016; Leiblein, Tucker, et al., 2017; Spagnolo et al., 2013). This includes internal and external people, who collaborate and work on this common process.

Certainly, law and duties vary from country to country which is, of course, not unusual to deal with for a locally or globally acting FM and FS business. However, the legal framework, standards or even potential threats are not always obvious to people responsible (Leiblein, Füchslin, et al., 2017).

An infected water system is a deficiency in a building and reduces the value of a facility. Above all, the hazard to people and the liability of duty holders may be two even strong arguments. Professionals with operator duties (FM / FS) must bear this in mind. More research in this particular field is needed because of the critical importance and complexity of the topic.

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