



# Workshop

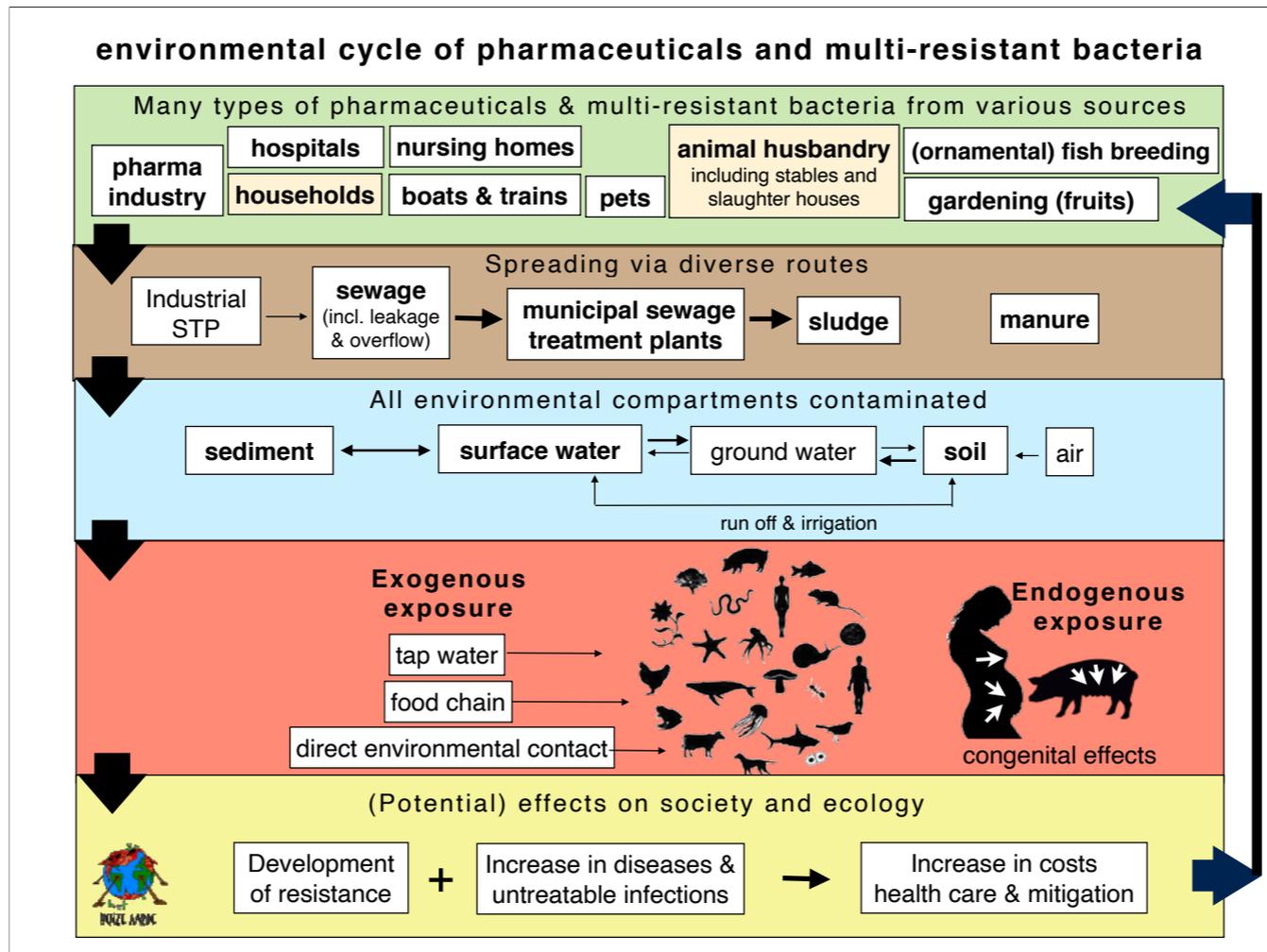
## There is only one health: environmental, animal and human health

by KNMvD and Huize Aarde

Nijmegen, November 29 2017



SHA works on innovations for integrated management of environment & health issues. Goal of SHA: cross sector and cross discipline collaboration to develop policies for an integrated approach.



On a worldwide scale veterinary and human pharmaceuticals and resistant micro-organisms generally reach the environment and return to us in low sub-therapeutic quantities through water, food and air. But they are persistent and mobile and accumulate in tissues. Most concerning is their behaviour: in very low concentrations they create new resistance patterns and act as hormones or endocrine disrupting compounds. => The environmental cycle of antibiotic resistance is part of environmental cycle of all human and veterinary pharmaceuticals. **The search for solutions to avoid this environmental cycle is an incentive for collaboration and innovations in whole pharmaceutical product cycle.**

Explanation of figure:

All types of medications and medicine-resistant micro-organisms are being secreted by human and animal urine and feces. The main sources are households and livestock. To a lesser extent, hospitals, nursing homes, and other sources. These chemical and biological contaminants are primarily distributed through effluents from sewage treatment plants and injected farm manure. They are found in fresh and salt surface water, groundwater, sediment, soil and air. Through water, food (plants absorb medicines) and air (dust from livestock) each organism is exposed to pharmaceuticals and medicine resistant micro-organisms. This happens not only exogenous but also possibly endogenously; through egg, placenta and breast milk. The effects can manifest themselves in various forms, as well as the extra costs for society.

=> This diffuse distribution, along with the many forms of these molecules and microorganisms, make monitoring, toxicology, risk assessment and risk management of medicines and resistance in the environmental cycle extremely complex.

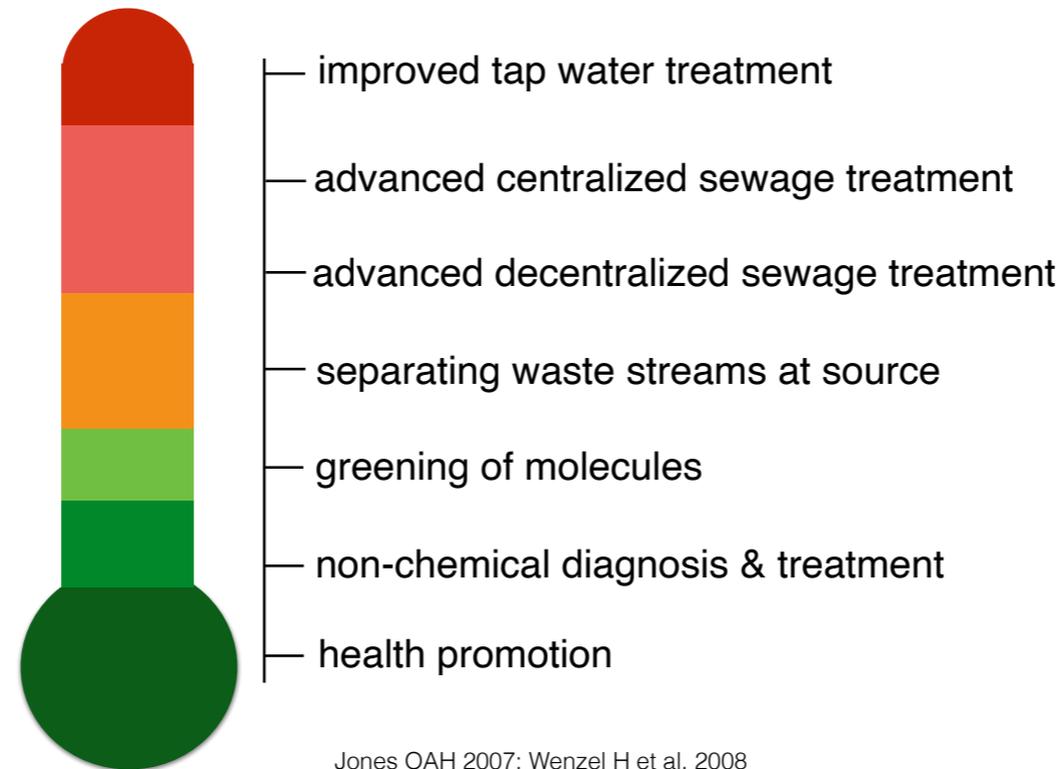
NL

Alle soorten medicijnen en medicijnresistenties worden door mens en dier via urine en ontlasting uitgescheiden. De belangrijkste bronnen zijn huishoudens en veeteeltbedrijven. In mindere mate ziekenhuizen, verzorgingshuizen, e.a. bronnen. Deze chemische en biologische verontreinigingen worden vooral via effluent van rioolwaterzuiveringsinstallaties en geïnjecteerde landbouwmest verspreid. Ze worden aangetroffen in zoet en zout oppervlaktewater, grondwater, sediment, bodem en lucht. Via water, voedsel (planten nemen medicijnen op) en lucht (stof uit veestallen) wordt ieder organisme aan medicijnen en medicijnresistenties blootgesteld. Dit gebeurt niet allen exogeen maar mogelijk ook endogeen; via ei, placenta en moedermelk. De gevolgen kunnen zich in verschillende vormen manifesteren, evenals de extra kosten voor de samenleving.

=> Deze diffuse verspreiding, samen met de vele verschijningsvormen van deze moleculen en micro-organismen, maakt monitoring, ecotoxicologie, risico-evaluatie en beheer van geneesmiddelen en resistentie in de milieukringloop uitermate complex.



## sustainability of possible innovations in human medicine chain



Jones OAH 2007; Wenzel H et al. 2008

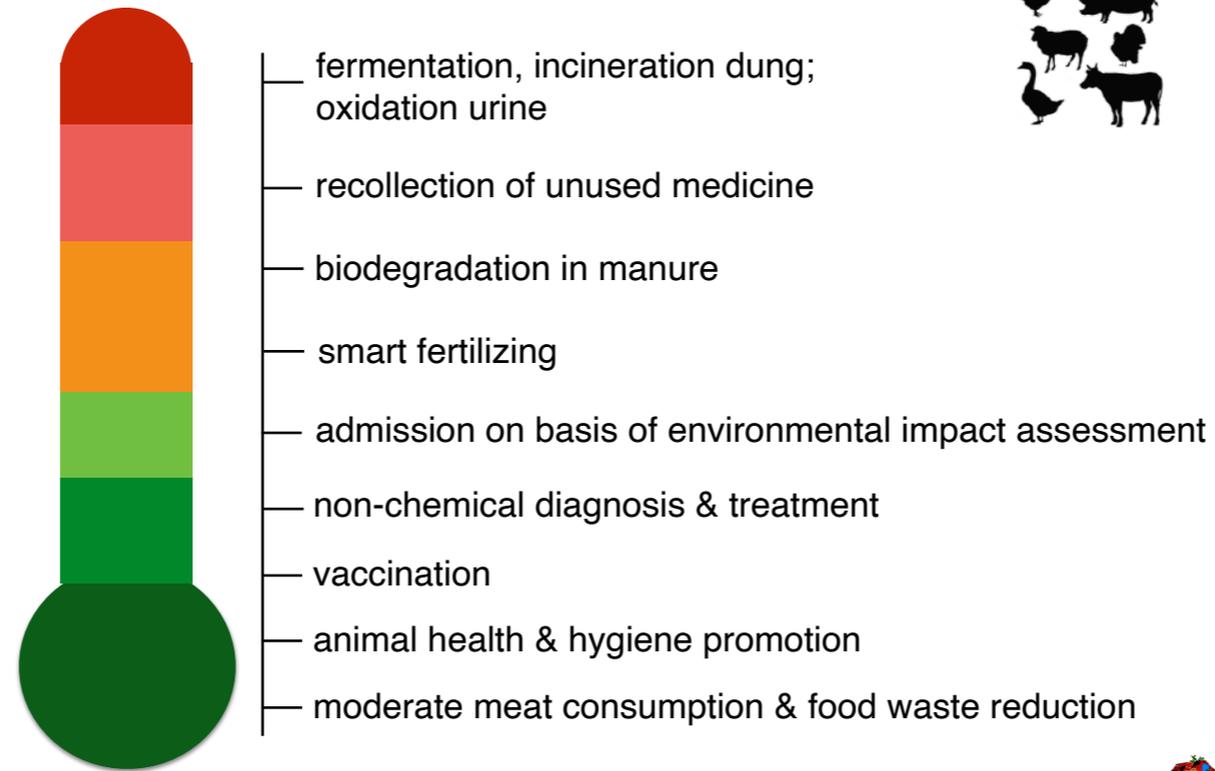


For this complex issue partial solutions aren't fruitful. An integrated approach is needed to avoid ecological and social damage in the whole product chain (Green Pharmacy). Here a "Sustainability Thermometer" is shown for measures that lower/reduce pharma-pollution. Presumably, the lower in the thermometer the more sustainable (more effective, less costly, less side effects) measures would be. For example, high-tech filters would create false safety (do not work 100%; there are too many sources; there are too many sources; quickly outdated because they are fast behind developments in pharmacy. Not sustainable due to high energy and purchase and maintenance costs, new toxic waste streams. The introduction of green molecules does not mean responsible use of medicines either.

Therefor:

- **To solve this complex contamination the development of a package of complementary source oriented measures by whole medicine chain is needed.**
- For this purpose a medicine chain wide total vision needed - like green pharmacy.
- Such an approach creates also more flexibility if exporting measures to other countries with other circumstances.
- Work out all options (effectivity, feasibility, and affordability) before making major investments.
- Apply a comprehensive/complete LCA-methodology, that includes social costs and benefit.
- Apply this approach to other micro-pollutants, eg. pesticides, microplastics.

## sustainability of possible innovations in veterinary medicine chain



Jibichibi B et al. 2007; Eikelenboom D et al. 2012.



see former slide

# MEDUWA - Vecht(e) 2017-2020

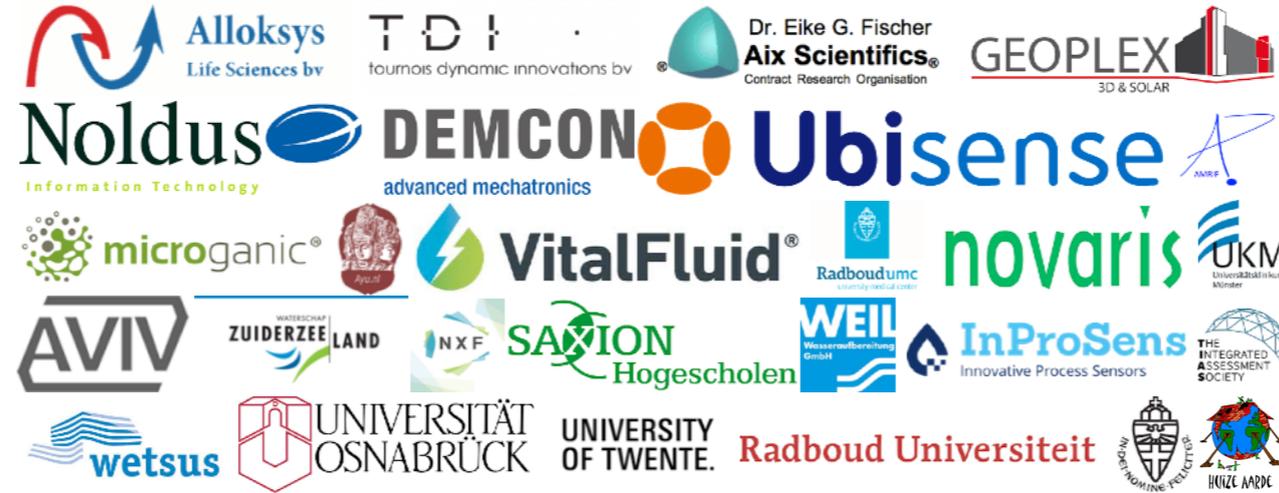


MEDizin Unerwünscht im WAsser  
MEDicines Unwanted in WAter  
MEDicijnen Uit het WAtter

SHA developed INTERREG-VA-project MEDUWA 2017-2020, a sister project of HiC and EH1H. Goal of MEDUWA: to develop a package of socially responsible measures to avoid the environmental cycle of human and veterinary medicines and antibiotic resistant micro-organisms.



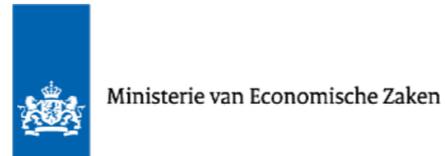
## inter-sectoral cross-border coalition for action & change



MEDUWA is a German-Dutch cross-border coalition of 16 companies, 5 research institutes, 2 academic hospitals, 1 government, and 2 NGO's from the water, agricultural and (human & veterinary) health sectors. The total budget is € 8,5 M.



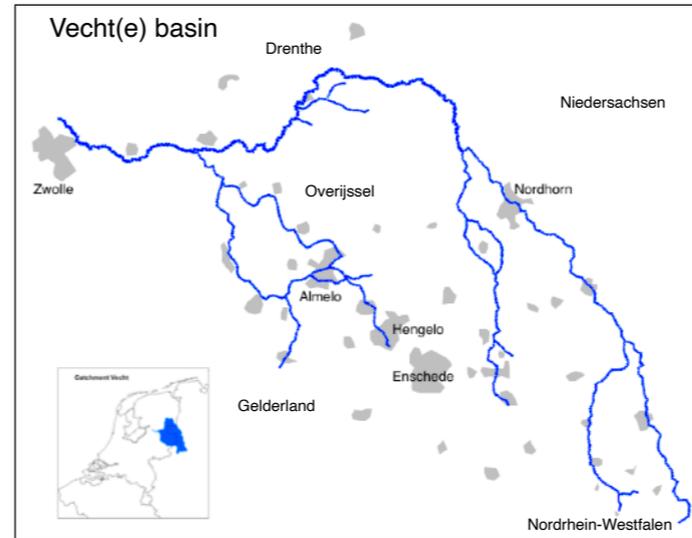
# Sponsors



Ministerium für Wirtschaft, Innovation,  
Digitalisierung und Energie  
des Landes Nordrhein-Westfalen



MEDUWA is subsidized by the EU Regional Development Fund (ERDF) and INTERREG Program Partners.



## Pilot area

**Area floodplain:** 3780 km<sup>2</sup>.

**Longitude Vecht(e) river:** 170 km.

**Water source:** 46-48% from Germany; 54-52 % from the Netherlands.

**Main tributaries:** Dinkel 89 km, Regge 50 km, Steinfurter Aa 46 km.

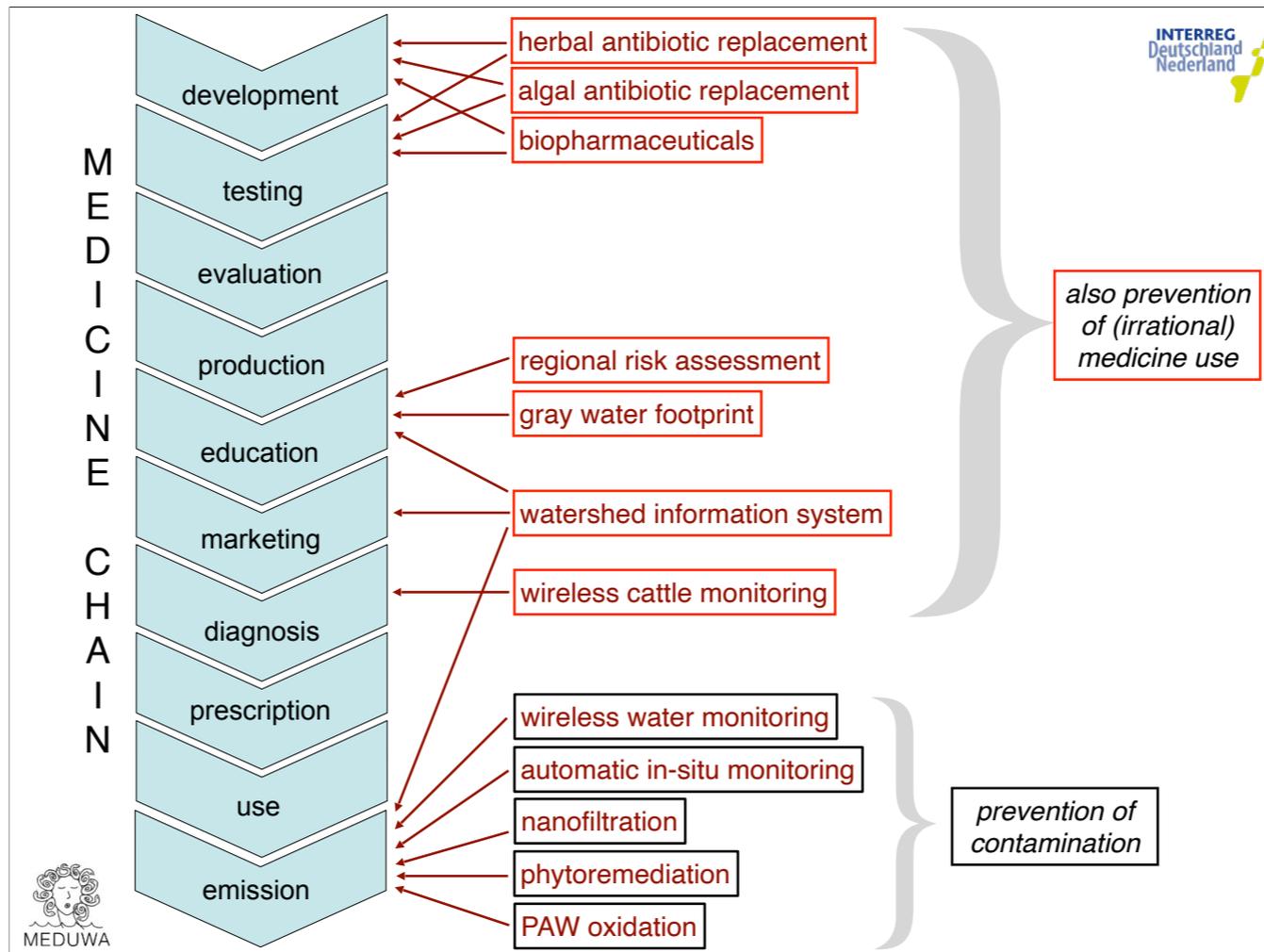
**Dutch Provinces:** Overijssel, Gelderland, Drenthe.

**German Länder:** Nordrhien-Westfalen, Niedersachsen.

**Total inhabitants:** 1,15 Million (DE ± 336.000; NL ± 816.000).

**Main municipalities (>20,000 inhabitants):** Enschede, Zwolle, Hengelo, Almelo, Hardenberg, Nordhorn, Gronau, Hellendoorn, Coevorden, Ahaus, Steinfurt, Oldenzaal, Rijssen, Dalfsen, Dinkelland, Wierden, Losser, Borne, Tubbergen.

The catchment is a drinking water source for the province of Overijssel. During prolonged dry periods the rivers of this watershed are comprised of 80 to 100 % treated water from sewage treatment plants. The water therefore contains relatively high concentrations of pharmaceuticals and bacteria (and their plasmids) that are resistant to human and veterinary antibiotics. During floods these so called micro-contaminants are spread over the floodplain.



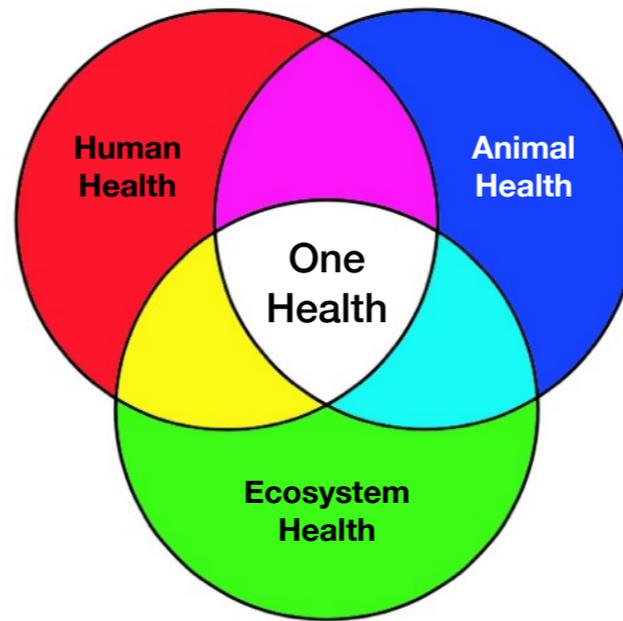
The interventions are developed for various links of the pharmaceutical chain. Tools like Watershed Information System, Gray Water Footprint and Regional Risk Assessment aim to strengthen socially responsible medicine use by the veterinary and human health sectors.

## MEDUWA nominated for EU Health Award



In 2017 MEDUWA has been nominated for the EU Health Award for NGO's.

The EU Jury Members valued and showed interest in the cross sector and cross disciplinary and innovative chain approach of MEDUWA.



**Statement:**

One Health strives for animal health, human health and environmental health together. By that One Health includes the avoidance of environmental & health effects of human and veterinary pharmaceutical use in general.