

Fighting against Urban Air Pollution: Mexico City and its Participation in the Pan American Air Pollution Sampling Network (1967–1980)

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ABSTRACTS

Der Beitrag befasst sich mit der mexikanischen Hauptstadt, die seit den 1930er Jahren gegen massive urbane Luftverschmutzung zu kämpfen hatte. Dabei möchte er eine weitere Perspektive auf das umwelthistorische Feld der Luftverschmutzung ermöglichen, indem er sich lokalen und nicht-westlichen Perspektiven öffnet, die viele bis dato veröffentlichte Verschmutzungsgeschichten vernachlässigten. Den Rahmen der Untersuchung bildet das panamerikanische Luftverschmutzungsüberwachungsnetzwerk REDPANAIRE, das in den 1960er Jahren im Umfeld der panamerikanischen Gesundheitsorganisation als entwicklungspolitische Antwort auf die mit der urbanen Luftverschmutzung verbundenen Herausforderungen entstand. Der Aufsatz beleuchtet dabei auch die lokale Wissensproduktion sowie Perspektiven, die sich im entwickelnden Global Governance-Prozess zur urbanen Luftverschmutzungsthematik eine wichtige Rolle spielten, bislang allerdings in der Forschung eine marginale Rolle spielten.

Der Beitrag argumentiert, dass die Teilnahme am REDPANAIRE für Mexiko-Stadt durchaus lohnenswert war, da sie den lokalen Verantwortlichen nicht nur umfassendere Einsichten in die urbane Luftverschmutzungsthematik erlaubten, sondern auch wertvolle entwicklungspolitische Kooperationen ermöglichten, die der Stadt im Kampf gegen die Luftverschmutzung halfen.

The article deals with the Mexican Capital, a city that has been struggling with massive urban air pollution since the 1930s. Within the framework of an environmental history, it considers air

pollution from local and pan-American perspectives. The Pan American Air Pollution Sampling Network REDPANAIRE serves as a framework for the study. The REDPANAIRE was set up in the 1960s by the Pan American Health Organization as a development policy response to the challenges posed by urban air pollution. The article also examines local knowledge production and perspectives that played an important role in the emerging global governance discourse on urban air pollution that have been marginalized in previous research. The article argues that Mexico City's participation in the REDPANAIRE was useful as it not only allowed local decision-makers to gain insight into urban air pollution issues, but also enabled valuable development cooperation that helped the city in its fight against air pollution.

Within the environmental history of the twentieth century, the environmental challenges and problems faced by the growing megacities of the 'Global South' typically receive little attention. Existing accounts focusing on problems of urban air pollution delineate key episodes in the Belgian Meuse Valley (1930), the Pennsylvanian City of Donora (1948), and the story of the London fog (1952), but hardly cover the experiences and approaches of urban communities beyond Western Europe and the United States. This article therefore seeks to provide a look at urban air pollution in a city outside the familiar frame of study: Mexico City. Long considered the city with the worst air quality world-wide, between the 1950s and 1970s Mexico City became the staging ground of new transnational research programmes and policy measures that sought to monitor urban air quality and take first action¹. My focus here is particularly on Mexico City's involvement in the Pan American Air Pollution Sampling Network REDPANAIRE, short for its Spanish name *Red Panamericana de Muestreo Normalizado de la Contaminación del Aire*.² Planned in 1965,³ this continental network was set up to monitor the most important contaminants and allowed the Pan American Health Organization (PAHO or

1 Further information on the first attempts to monitor urban air pollution in Mexico City provide: H. Bravo A./G. Viniestra O., Informe Preliminar Acerca de la Polución Atmosférica en la Ciudad de México, in: Revista Mexicana de Ingeniería y Arquitectura 38 (1959) 3, pp. 14–17 and H. Bravo A./A. P. Báez/S. Lares, Estudio del Depósito de Polvo Por Gravedad en la ciudad de México, in: Ingeniería Química Junio (1960), pp. 26–28.

2 Interestingly, the English name for the Pan-American network was not well established among its participants. While an annual report of the CEPIS refers to it as Pan American Air Pollution Sampling Network, REDPANAIRE reports refer to it as *Pan American Air Pollution Monitoring Network*. Mexican researcher H. Bravo also spoke in one of his English papers of the *Pan American Air Monitoring Network*. See Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente, Annual Report 1970, Lima 1971, p. 11; Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente/Organización Panamericana de la Salud/Organización Mundial de la Salud, Pan American Air Pollution Monitoring Network REDPANAIRE. Preliminary Report of Results June 1967– December 1973, Lima 1974. Bravo's short paper was published under his second surname, probably because the editors were not familiar with naming customs in the Spanish speaking world. See H. Alvarez, Pan American Air Monitoring Network. In: T. Schneider/H. W. De Koning/L. J. Brasser (eds.), Air Pollution Reference Measurement Methods and Systems. Proceedings of the International Workshop, Bilthoven, December 12–16, 1977, Amsterdam 1978, pp. 95–97.

3 Pan American Health Organization, Annual Report of the Director of the Pan American Sanitary Bureau, Regional Office of the World Health Organization 1965, Washington, D.C. 1966, p. 74.

OPS for Spanish: *Organización Panamericana de la Salud*) as well as the respective cities and countries to get a better grasp of the air pollution situation in the region.⁴

Based on contemporary documents, the article firstly sketches the origins of urban air pollution in Mexico City. It then explores when, how and why stakeholders operating on different governance layers became aware of the problem and how they sought to address the problem through the REDPANAIRES. Third, it explores Mexico City's participation in the Pan-American project and evaluates the importance of its participation. The article argues that Mexico City's participation in the REDPANAIRES was initially useful, since it allowed the Mexican capital to compare the extent of its urban air pollution with other participating cities and enabled valuable cooperation with actors and experts from different governance layers. By the time of withdrawal, Mexico City had achieved its main goals and moved forward to cope with another dimension of pollution which required more elaborate measures.

Researching Mexico City's participation in the REDPANAIRES is promising from a historian's standpoint, because research related to the Mexican capital's involvement was and still is scarce, mostly due to limited sources. Contemporary research, i.e. during the time of REDPANAIRES (1967–1980), on air pollution was mainly conducted by scientists from Mexico, such as chemist Humberto Álvarez Bravo, climatologist Domingo Ernesto Jáuregui Ostos and later on also Enrique Márquez Mayaudón, who, since the late 1950s, contributed significantly to create (global) awareness for Mexico City's air pollution through their extensive publications.⁵ Furthermore, Ricardo Haddad, the founding

4 This was necessary because at the beginning of PAHO's regional programme, practically no country was aware, of the real magnitude of its air pollution problems. See R. Haddad: Contaminación del Aire. Situación Actual en la América Latina y el Caribe, in: Organización Panamericana de la Salud, Organización Mundial de la Salud, Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente (eds.) Simposio sobre Ambiente, Salud y Desarrollo en las Américas. México, D.F. 29. de Julio al 2 de Agosto de 1974, Lima 1976, p. 2.

5 Their publications include Álvarez, Pan American Air Monitoring Network, pp. 95–97; H. Bravo/R. Torres, Situación Actual de la Calidad del Aire en México, in: H. Weidner/T.H. Hilker (eds.), Hacia una Conciencia Ecológica. Políticas de Calidad del Aire en América Latina, Caracas 1989, pp. 115–134; H. Bravo A., Las Bases para la Elaboración de Reglamentos para el Control, in: Centro de Educación Continua de la Facultad de Ingeniería de la Universidad Autónoma de México (ed.), Control de la Contaminación Atmosférica, México D.F. 1971, pp. 1–96; H. Bravo A., Variación de Diferentes Contaminantes en la Atmósfera de la Ciudad de México, in: Asociación Argentina contra la Contaminación del Aire (ed.), Primer Congreso Mundial sobre Contaminación del Aire. Buenos Aires, 14–21 noviembre 1965. Actas. Tomo I. Buenos Aires 1966, pp. 89–90; H. Bravo Álvarez, Variation of Different Pollutants in the Atmosphere of Mexico City, in: Journal of the Air Pollution Control Association 10 (1960) 6, pp. 447–449; Bravo, Báez and Lares, Estudio, pp. 26–28; H. Bravo/A. Magaña/R. Magaña, The Actual Air Pollution Situation in Mexico City, in: Staub – Reinhaltung der Luft 39 (1979), pp. 427–428; Bravo Álvarez/G. Viniegra O., Informe, pp. 5–17; D. Klaus/W. Lauer/E. Jáuregui, Schadstoffbelastung und Stadtklima in Mexiko-Stadt, Mainz 1988; E. Jáuregui, The Urban Climate of Mexico City, in: Erdkunde 27, Heft 4 (1973), pp. 298–307; E. Jáuregui, Efectos de la Urbanización en el Clima del Valle de México, in: Momento Económico 41–42 (1988), pp. 6–7; E. Jáuregui Ostos, Aspectos Meteorológicos de la Contaminación del Aire en la Ciudad de México, in: Ingeniería Hidráulica en México XXIII (1969) 1, pp. 17–28; Idem, Las Tolvaneras de la Ciudad de México, in: Ingeniería hidráulica en México. Octubre–Noviembre–Diciembre (1960), pp. 60–66; Idem, El aumento de la turbiedad del aire en la Ciudad de México, in: Ingeniería Hidráulica en México Octubre – Noviembre – Diciembre (1958), pp. 9–18; Idem, La Meteorología y el Ambiente Urbano en la Ciudad de México, in: Instituto Mexicano de Recursos Naturales Renovables (ed.), Primer Seminario sobre Evaluación de la Contaminación Ambiental. Centro de Capacitación de Personal de la C.F.E., Atlahuetzia, Tlax., 21 a 24 de octubre de 1971. Aportación para la Comisión Preparatoria de México a la Conferencia de las Naciones Unidas sobre el Medio Humano Estocolmo, 1972, Mé-

father of the REDPANAIRES who managed and coordinated the network from its inception, edited its reports published on the REDPANAIRES.⁶ His reports, together with annual reports of the Pan American Center for Sanitary Engineering and Environmental Sciences (CEPIS, short for Spanish: *Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente*), are another important source for this article as there are currently no records available in the Mexican *Archivo General de la Nación*. When it comes to recent publications, Brazilian Environmental Historians Lise Sedrez and Regina Horta Duarte have a critical look at the REDPANAIRES.⁷

By addressing Mexico City's history of urban air pollution, the article also seeks to contribute local perspectives on the historical evolution of global governance. According to Held and McGrew, the term global governance describes a complex system of "rule-making, political coordination and problem-solving which transcend[s] states and societies", operating at levels ranging from local to global. As such a system of rule-making, global governance "regulates and intervenes in virtually all aspects of global affairs", and

xico, D.F. 1972, pp. 19–24; E. Márquez Mayaudón, Actividades de la Secretaría de Salubridad y Asistencia en la Evaluación de la Contaminación del Aire, in: *Salud Pública de México* 14 (1972) 3, pp. 417–422; Idem, Aire Sucio. Contaminación, in: *Salud Pública de México* 12 (1970) 2, pp. 133–136; Idem, Anexo al tema IV. Relato de México. Necesidades Actuales y Futuras para un Programa Adecuado de Evaluación y Control. In: Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente / Organización Panamericana de la Salud / Organización Mundial de la Salud (ed.), *Seminario Latinoamericano de Contaminación del Aire*. Washington 1970, pp. 207–208; Idem, Contaminación Ambiental, in: *Salud Pública de México* XIII (1971) 2, pp. 133–140; Idem, La contaminación del aire, in: *Salud Pública de México* XII (1970) 1, pp. 45–50; Idem, Estado Actual de la Contaminación del Aire en la Ciudad de México, in: *Salud Pública de México* XI (1969) 1, pp. 99–104; Idem, Evaluación de la Contaminación del Aire en el Valle de México, in: *Salud Pública de México* XII (1970) 5, pp. 629–637; Idem, Información de la Calidad del Aire en algunas Ciudades del País. Datos de la Calidad del Aire en el País, in: *Salud Pública de México* 19 (1977) 4, pp. 501–535; Idem, Muestreo de Grandes Volúmenes de Aire en el Valle de México para determinar Concentración de Partículas en Suspensión, in: *Salud Pública de México* 19 (1977) 2, pp. 263–272; Idem, Red Computarizada Automática de Monitoreo del Aire del Valle de México (RECAMA), in: *Salud Pública de México* 17 (1975) 5, pp. 699–706; Idem, Tema III. Proyecciones Futuras del Problema, in: Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente/Organización Panamericana de la Salud/Organización Mundial de la Salud (eds.), *Seminario Latinoamericano de Contaminación del Aire*, Washington 1970, pp. 155–176.

6 The CEPIS issued several publications connected to the REDPANAIRES that either aimed to summarize and disseminate the results of the measurements or supported the memberstates in setting up stations: See Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente / Organización Panamericana de la Salud / Organización Mundial de la Salud, *Red Panamericana de Muestreo de la Contaminación del Aire. Equipo y Materiales para sus Estaciones*, Lima 1971; Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente / Organización Panamericana de la Salud / Organización Mundial de la Salud, *Seminario Latinoamericano de Contaminación del Aire*, Washington, D.C. 1970; Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente / Organización Panamericana de la Salud/OMS, *Red Panamericana de Muestreo de la Contaminación del Aire (REDPANAIRES). Informe 1967–1974*; Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente / Organización Panamericana de la Salud/OMS, *Red Panamericana de Muestreo de la Contaminación del Aire (REDPANAIRES). Informe Final 1967–1980*, Lima 1982; Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente / Organización Panamericana de la Salud / Organización Mundial de la Salud, *Red Panamericana de Muestreo de la Contaminación del Aire. Manual de Operaciones*, Lima 1970; Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente / Organización Panamericana de la Salud / OMS, *Red Panamericana de Muestreo de la Contaminación del Aire. Resultados obtenidos Junio 1967–Diciembre 1970*, Lima 1971; CEPIS/OPS/OMS, *Results 1967–1973*.

7 See L. Sedrez/R. Horta Duarte, *The Ivy and the Wall: Environmental Narratives from an Urban Continent*, in: J. Soluri/C. Leal/J. A. Padua (eds.), *A Living Past Environmental Histories of Modern Latin America*, New York 2018, pp. 138–162.

is often composed of different actors, whose functional and spatial competences are often overlapping.⁸ As Marc Frey, Sönke Kunkel, and Corinna Unger have argued, historical forms of global governance are closely connected to “the evolution of global development policy”⁹ and the interplay between international organizations, non-state actors, and states.¹⁰ Within this framework, international organizations “turned into influential producers and brokers of knowledge, whose reports, statistics, and conferences led to a global circulation of development ideas and doctrines”¹¹ – a process that was also at work in the field of urban air pollution as metropolises in developing countries sought to address the problem by cooperating with international organizations.

1. Mexico City – The City with the Worst Air Quality World-Wide

Situated in an elevated basin surrounded by mountains, Mexico City has for a long time faced the special challenge of urban air pollution, mainly because certain natural phenomena impede natural air cleaning mechanisms.¹² Winds typically only enter the valley through an open gap in the North, while mountains to the West, South and East of the city decelerate the wind’s intensity and velocity and thereby highly restrict the city’s air ventilation. At the same time, the bulk of Mexico’s industry is situated in the North East

- 8 D. Held / A. McGrew, Introduction, in: D. Held and A. McGrew (eds.), *Governing Globalization. Power, Authority and Global Governance*, Cambridge 2002, p. 8.
- 9 M. Frey / S. Kunkel / C.R. Unger, Introduction: International Organizations, Global Development, and the Making of the Contemporary World, in: M. Frey / S. Kunkel / C. R. Unger (eds.), *International Organizations and Development, 1945–1990*, London 2014, p. 4. – See also D. Held / A. McGrew, Preface, in: D. Held / A. McGrew (eds.), *Governing Globalization. Power, Authority and Global Governance*, Cambridge 2002, p. XI; Held / McGrew, Introduction, p. 9.
- 10 Frey / Kunkel / Unger, Introduction, pp. 4–8. – Also, M. Frey, *Entwicklungspolitik*, in: J. Dülffer / W. Loth (eds.), *Dimensionen internationaler Geschichte*, Berlin 2012, pp. 295–298 outlines the origins of development policy mentioning the Bruce Report as a milestone. Furthermore, A. L. S. Staples, *The Birth of Development. How the World Bank, Food and Agriculture Organization, and World Health Organization Changed the World, 1945–1965*. Kent 2006 explores the “birth” of development, though she focuses on the past World War II era.
- 11 Frey, Kunkel / Unger, Introduction, p. 8.
- 12 See Bravo / Báez / Lares, *Estudio*, p. 26; Bravo / Magaña / Magaña, *Air Pollution Situation*, p. 427; Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente, *Informe Anual 1969*, Lima 1970, p. 1, p. 8 and p. 20; CEPIS / OPS / OMS, *Informe Final*, p. 26; R. Haddad / J. J. Bloomfield, *La Contaminación Atmosférica en América Latina*, in: *Boletín de la Oficina Sanitaria Panamericana* 57 (1964) 3, pp. 241–246; Jáuregui Ostos, *Efectos*, p. 6; Jáuregui Ostos, *Aspectos*, p. 18; Jáuregui Ostos, *Meteorología y el Ambiente Urbano*, pp. 19–20; F. López de Alba, *Políticas y estrategias de abatimiento y control de la contaminación atmosférica en la Zona Metropolitana de la Ciudad de México*. De 2 al 6 Noviembre de 1987. Metepec, Puebla, México, México, D.F. 1987, pp. 14–22; E. Rapoport / I. López-Moreno, *Algunos Problemas de la Ecología Urbana de la Ciudad de México*, in: Programa Universitario Justo Sierra (ed.), *El Desarrollo Urbano en México. Problemas y Perspectivas*. Coloquio, México 1984, p. 241; M. Schteingart, *Mexico City*, in: M. Dogan / J. D. Kasarda (eds.), *The Metropolitan Era*. Vol. 2: *Megacities*, Newbury Park 1989, pp. 268–293, p. 281; Sedrez / Horta Duarte, *Ivy and the Wall*, p. 154, P. Ward, *Mexiko-Stadt*, in: L. Beckel (ed.), *Megacities. Ein Beitrag der Europäischen Raumfahrtagentur zum besseren Verständnis einer globalen Herausforderung*, Salzburg 2001, p. 239; World Health Organisation. Expert Committee on Environmental Sanitation, *Air pollution. Fifth report of the Expert Committee on Environmental Sanitation*. [Meeting held in Geneva from 18 to 23 November 1957], Geneva 1958, pp. 5–8.

of the City, emitting significant levels of air pollutants into the urban atmosphere.¹³ *Tolvaneras* (dust storms), emerging due to deforestation and the desertification of lakes, are another phenomenon that causes air pollution in the Mexican capital, especially during the end of the dry season (October–April). In those months, dust particles, e.g. from the dried-out Lake Texcoco are often whirled up and transported through wind erosion to the city, where they deposit and impede visibility.¹⁴ Lastly, inversions play an important role for Mexico's climate, too, since they fuel air pollution, restricted visibility, and smog especially during winter nights.¹⁵

Historically, the experience of little ventilation, *tolvaneras*, and inversions had for a long time been a central fact of life within Mexico City, which many residents were used to and had adapted to. Since the 1930s, however, a number of urban processes dramatically compounded their impact. By that time, many factories began to settle down in the Mexican Valley and through their emissions contributed to a substantial increase of urban air pollution.¹⁶ Rapid population growth, too, fuelled air pollution, as it was accompanied by an increase in domestic combustion processes (heating, cooking, burning garbage).¹⁷ Not least, since the mid twentieth century, an increasing number of motor

- 13 Bravo/Báez/Lares, Estudio, pp. 26–28 also provide graphics to explain the phenomenon. Cf also: H. Bravo Alvarez, *La Contaminación del Aire en México*, México, D.F. 1987, p. 127; Comisión Preparatoria de la Participación de México en la Conferencia de las Naciones Unidas sobre el Medio Humano, Informe nacional, México 1971, p. 10; Haddad/Bloomfield, Contaminación, p. 246; Jáuregui Ostos, *Meteorología y el Ambiente Urbano*, p. 20; R. Lacy, *La calidad del aire en el Valle de México*, Mexico City 1993, pp. 41–42; G. Orozco Carricarte, Generalidades sobre la Contaminación Atmosférica, in: Instituto Mexicano de Recursos Naturales Renovables (ed.), *Primer Seminario sobre Evaluación de la Contaminación Ambiental*. Centro de Capacitación de Personal de la C.F.E., Atlahuetzia, Tlax., 21 a 24 de octubre de 1971. Aportación para la Comisión Preparatoria de México a la Conferencia de las Naciones Unidas sobre el Medio Humano Estocolmo, 1972, México, D.F. 1972, p.13.
- 14 Bravo Alvarez, *La Contaminación*, pp. 136–141 explains this phenomenon vividly, also a few other publications cover air pollution caused by *tolvaneras* such as: Bravo, Magaña and Magaña, *Air Pollution Situation*, p. 428; Comisión Preparatoria, Informe nacional, pp. 20–21; CEPIS/OPS/OMS, *Seminario Latinoamericano*, pp. 113–114; Jáuregui Ostos, *Meteorología y el Ambiente Urbano*, p. 22; Lacy, *La Calidad del Aire*, p. 42; López de Alba, *Políticas y Estrategias*, pp. 37–38; Secretaría de Salubridad y Asistencia, *Situación actual de la contaminación atmosférica en el área metropolitana de la Ciudad de México*, México ²1978, p. 32.
- 15 Bravo Alvarez, *La Contaminación*, p. 15, p. 26, pp. 131–132 and p. 275 who explains the phenomenon in detail, also referring to a graphic he drafted on p. 25. Also, P. R. Ehrlich/A. H. Ehrlich, *Bevölkerungswachstum und Umweltkrise*, Frankfurt am Main 1972, p. 163 and López de Alba, *Políticas y Estrategias*, p. 20 provide an excellent chart. Furthermore, several other publications explain the phenomenon such as: Bravo/Magaña/Magaña, *Air Pollution Situation*, p. 427; Comisión Preparatoria, Informe nacional, pp. 21–22; Jáuregui Ostos, *Meteorología y el Ambiente Urbano*, p. 21; Lacy, *La Calidad del Aire*, pp. 43–44; Orozco Carricarte, Generalidades, p. 13.
- 16 Bravo Alvarez, *La Contaminación*, p. 15; CEPIS/OPS/OMS, *Seminario Latinoamericano*, p. 77; Comisión Preparatoria, Informe nacional, especialmente p. 5 and p. 40; A. Gilbert, *The Latin American Mega-City*. An Introduction, in: A. Gilbert (ed.), *The Mega-City in Latin America*, Tokyo 1996, p. 1; Haddad, *Contaminación del Aire. Situación Actual*, p. 5; Haddad/Bloomfield, *Contaminación*, pp. 241–259; López de Alba, *Políticas y Estrategias*, p. 28; Parnreiter, *Mexico City*, p. 176–178; Secretaría de Salubridad y Asistencia, *Situación*, p. 13.
- 17 In a questionnaire on the occasion of the *Seminario sobre Contaminación del Aire*, which took place in Rio de Janeiro (Brazil) in 1968, Mexico listed further sources of its air pollution, including kitchen use in private households, refineries and the use of agricultural vehicles. The complete list can be found at CEPIS/OPS/OMS, *Seminario Latinoamericano*, pp. 113–114. Also, E. Beltrán, *Palabras Inaugurales*, in: Instituto Mexicano de Recursos Naturales Renovables (ed.), *Primer Seminario sobre evaluación de la contaminación ambiental*. Centro de Capacitación de Personal de la C.F.E., Atlahuetzia, Tlax., 21 a 24 de octubre de 1971. Aportación para la Comisión Preparatoria de México a la Conferencia de las Naciones Unidas sobre el Medio Humano Estocolmo, 1972, México, D.F. 1972, p. XIV; Bravo Alvarez, *La Contaminación*, p. 152; Centro Panamericano de Ingeniería Sanitaria y

vehicles emitted contaminants – a fact that was often ignored by developing countries because, compared to the Western world, the number of cars was still quite low. However, due to Mexico City's altitude, combustion residues had a more harmful impact on the atmosphere, therefore making vehicle combustions a topic that had to be discussed to attain better pollution control.¹⁸

The first signs of the serious extent of air pollution in Mexico City became tangible in the early 1950s when an incident in Poza Rica created national awareness for air pollution. On 24 November 1950, there was an accident at a local refinery, where unfiltered hydrogen sulfide (H_2S) intruded into the local atmosphere and affected the central nervous system and respiratory tract of 320 inhabitants. 263 of these persons suffered from slight intoxications, 45 were severely injured and 22 lost their lives.¹⁹ Furthermore, photos taken in the 1950s in Mexico City proved that urban air pollution made the local population suffer.²⁰

Since the mid-1950s, researchers and politicians began to address these problems, mainly by trying to measure the extent of air pollution within the city. National authorities involved in investigating air pollution were the Mexican Secretary of Health, the *Secretaría de Salubridad y Asistencia* (SSA), and its branch, the Industrial Hygiene Department *Dirección de Higiene Industrial* (DHI) which undertook and supported the first studies and measurements on pollution in the Mexican Valley.²¹ Bravo, the head of the DHI's laboratory and researcher at the local UNAM University, conducted a first important study on air pollution in 1959/1960 based on a simple monitoring network with 28 stations that collected samples for a year.²² In addition, climatologist Ernesto Jáuregui began to estimate the extent of air pollution in Mexico City by evaluating the visibility, publishing one of the first papers on these relationships with his paper on *El aumento de la turbiedad del aire en la ciudad de México*.²³ In his other publications, Jáuregui observed

Ciencias del Ambiente, Informe Anual 1974, Lima 1975, p. 4; Haddad, Contaminación del Aire. Situación Actual, p. 5; M. E. Korc/R. Sáenz, Monitoreo de la Calidad del Aire en América Latina, Lima 1999, p. 1 list up further pollution sources.

- 18 CEPIS/OPS/OMS, Seminario Latinoamericano, p. 165; Alvarez, Pan American Air Monitoring Network, pp. 95–97; Bravo Alvarez, La Contaminación, especially p. 15, p. 127, pp. 143–144 and p. 275; Comisión Preparatoria, Informe Nacional, p. 19; CEPIS/OPS/OMS, Informe 1967–1974, p. 4; CEPIS/OPS/OMS, Informe final, p. 38; Haddad, Contaminación del Aire. Situación Actual, pp. 4–5; Haddad/Bloomfield, Contaminación, p. 246; López de Alba, Políticas y Estrategias, p. 28 and p. 34; Orozco Carricarte, Generalidades, pp. 14–15; Secretaría de Salubridad y Asistencia, Situación, p. 24, p. 32 and p. 62.
- 19 Haddad/Bloomfield, Contaminación, p. 246. They also mention similar incidents in Amatlán and Zacamixtlé, which had already occurred in 1922. So does Bravo Alvarez, La Contaminación, p. 14. Furthermore, Ehrlich/Ehrlich, Bevölkerungswachstum und Umweltkrise, pp. 156–157 and Orozco Carricarte, Generalidades, p. 13 sketch the most important facts concerning the incidents.
- 20 Jáuregui O., Las Tolvaneras de la Ciudad de México, pp. 61–64.
- 21 López de Alba, Políticas y estrategias, p. 29; Márquez Mayaudón, Actividades de la SSA, p. 418; Márquez Mayaudón, Información, p. 501; G. Viniegra, Dirección de Higiene Industrial, in: Salud Pública de México VI (1964) 6, pp. 1249–1260.
- 22 Further information on the study and first results provide Bravo/Báez/Lares, Estudio, pp. 26–28; Bravo Alvarez/Viniegra, Informe, pp. 5–17.
- 23 See Jáuregui Ostos, Aumento de la turbiedad, pp. 9–18.

that visibility had decreased significantly from 15–20 km in 1937 to approximately 2–4 km in 1966.²⁴

By the mid-1960s, the Mexican Government took further steps. Firstly, in 1966 the DHI initiated its research programme; secondly, the DHI started training personnel, either through courses in Mexico or by sending them abroad with scholarships. Thirdly, the REDPANAIRE started its measurement activities in the Mexican capital in August 1967.²⁵

In the following years, air pollution also became an important topic for the Mexican government, not least since Mexico was invited to join the Preparation Committees for the United Nations Conference on the Human Environment (UNCHE).²⁶ The new Mexican President Luis Echeverría underlined in his inaugural speech that Mexico was ready to fight environmental problems. A large part of the air pollution monitoring measures were initiated during his term (1970–1976).²⁷

2. Setting up the REDPANAIRE: The PAHO and the Launch of the First Comprehensive Monitoring Network

International environmental historians typically see the 1972 UNCHE as the moment when environmental issues were propelled to the international scene. A look at the issue of urban air pollution, however, shows that environmental themes had arrived long before on the agendas of international organizations. One of the first international organizations to address the air pollution problem in its development policy, for example, was the Geneva based World Health Organization (WHO) which dedicated its 1957 bi-annual Expert Committee on Environmental Sanitation meeting to air pollution. Experts assembled at the meeting discussed the topic extensively, provided a first and important definition of air pollution²⁸ and also stated that air pollution episodes could be

24 Jáuregui Ostos, *Meteorología y el Ambiente Urbano*, p. 20 and the graphs documenting his research on 21. See also Bravo Alvarez, *La Contaminación*, p. 136.

25 Comisión Preparatoria, *Informe Nacional*, p. 31 and p. 35; Haddad/Bloomfield, *Contaminación*, p. 247; López de Alba, *Políticas y Estrategias*, pp. 29–30; Márquez Mayaudón, *Actividades de la SSA*, p. 418; Márquez Mayaudón, *Contaminación Ambiental*, p. 138.

26 During the first meeting of the Preparation Committee, Mexican delegate Mrs. Neoma de Castañeda chaired a working group on the Preparation of national reports. However, she did not take part in the second Preparation Committee. See UN General Assembly, Preparatory Committee for the United Nations Conference on the Human Environment. First Session. 10–20 March 1970. Report of the Preparatory Committee for the United Nations Conference on the Human Environment. A/CONF.48/PC/6, New York 1970, p. 4. For Mexico's participation in the remaining Committee meetings see UN General Assembly, Preparatory Committee for the United Nations Conference on the Human Environment. Second Session. Geneva, 8–19 February 1971. Report of the Preparatory Committee for the United Nations Conference on the Human Environment. A/CONF.48/PC/9, Geneva 1971, p. 48. UN General Assembly, Preparatory Committee for the United Nations Conference on the Human Environment. Third Session. New York, 13–24 September 1971. Report of the Preparatory Committee for the United Nations Conference on the Human Environment. A/CONF.48/PC/13, New York 1971.

27 See López de Alba, *Políticas y Estrategias*, p. 4 and pp. 29–32.

28 WHO Expert Committee, *Air pollution*, pp. 3–4 defined air pollution as “situations in which the outdoor ambient atmosphere contains materials in concentrations which are harmful to man or to his environment”.

recognized not only by limited visibility and visible damage, but by strange smells, skin irritations or an acidic taste.²⁹ The Expert Committee encouraged not only institutions and agencies to undertake interdisciplinary research activities, but also wanted to assist developing countries to introduce monitoring programmes. This way, it encouraged environmental problems such as air pollution to become a field of development policy.³⁰

Since the early 1960s, the PAHO, too, supported its member states to address the problem of air pollution, frequently pointing out in its reports that air pollution was a health threat that was becoming more and more evident in the major cities of the region.³¹ In 1965, the PAHO's board also passed a resolution urging its director to pay attention to the increasing problems of air pollution in the region and to assist those countries and cities concerned.³² Consequently, at the end of 1966, the PAHO decided to establish a permanent regional air pollution consultant,³³ making it one of the first international organizations to have staff that dedicated their work exclusively to environmental issues.³⁴ The post – which was initially a part-time job – was taken by Ricardo Haddad who had worked before as Deputy Director at the *Instituto de Higiene del Trabajo del Servicio Nacional de Salud* (Institute of Occupational Hygiene of the National Health Service) in Chile. His task was to promote activities to improve air quality. In the following years, he and his staff visited Latin American and Caribbean countries, where they talked to decision makers, informing themselves about the current state of air pollution and offered to help establish prevention and control programmes, and signed the first cooperation agreements.³⁵

More important, since 1965 the PAHO also promoted the creation of a regional network of “a series of posts to measure air pollution in ten urban centres of Latin America”³⁶ – the REDPANAIRE, which, in the late 1960s and early 1970s, was the only air pollution

29 WHO Expert Committee, Air pollution, p. 4.

30 WHO Expert Committee, Air pollution, pp. 10 and p. 18.

31 CEPIS/OPS/OMS, Manual de Operaciones, p. 2; Haddad, Contaminación del Aire. Situación Actual, p. 1.

32 CEPIS/OPS/OMS, Informe Final, p. 5; CEPIS/OPS/OMS, Resultados 1967–1970, p. 3. – Interestingly, CEPIS, Informe Anual 1969, pp. 8–9 states that the PAHO had already in 1961 air pollution on its agenda, when it collaborated with the Chilean Instituto de Higiene del Trabajo y Contaminación Atmosférica.

33 The original name of this position was quoted as “Asesor en Contaminación del Aire”, “consultor regional permanente”, “Asesoría Regional en Contaminación del Aire” and “asesoría permanente en Contaminación Atmosférica”. See CEPIS/OPS/OMS, Informe Final, p. 5; CEPIS/OPS/OMS, Resultados 1967–1970, p. 3; CEPIS/OPS/OMS, Seminario Latinoamericano, p. 2; Haddad, Contaminación del Aire. Situación Actual, p. 1.

34 The International Bank for Reconstruction and Development (World Bank) installed the post of an environmental adviser in 1970. His task was to establish the Office of Environmental and Health Affairs (OEHA). See R. Wade: Greening the Bank: The Struggle over the Environment, 1970–1995, in: D. Kapur / J. P. Lewis / R. Webb (eds.), The World Bank. Its First Half Century. Vol. 2: Perspectives. Washington, D.C. 1997, pp. 618 and 731, but also an interview with James Lee, who was the first environmental adviser: B. Chokel, Transcript of interview with Dr. James Lee, April 4 1985, Washington, D.C. 1985.

35 Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente, Informe Anual 1972, Lima 1973, p. 2; CEPIS, Informe Anual 1969, p. 10; CEPIS/OPS/OMS, Manual de Operaciones, p. 3; CEPIS/OPS/OMS, Resultados 1967–1970, p. 5.

36 World Health Organization, The Work of WHO 1965. Annual report of the Director-General to the World Health Assembly and to the United Nations, Geneva 1966, p. 103.

monitoring network operating on a transnational level.³⁷ The REDPANAIRE pursued two major objectives. First, to obtain data through standardized measurements which would build a quantitative base that allowed governments and authorities concerned to get a deeper insight into the extent of air pollution. The evaluation of the results was thought to serve as a starting point for appropriate pollution control measures that would neither hinder the industrialization process nor surpass the financial and human resources of the cities and authorities concerned. Secondly, the REDPANAIRE wanted to raise awareness for air pollution and its consequences, sensitizing not only its participants, but also those officials and health authorities in Latin American and Caribbean cities and countries that had not signed up for the programme.³⁸

Preparations for the REDPANAIRE started in 1965 when the PAHO began to buy simple equipment for ten monitoring stations. PAHO and later CEPIS underlined the importance of using affordable and accessible equipment because most countries of the region had only very limited financial and human resources. They hoped that a low-threshold access would encourage other countries and cities of the region to take part in the network.³⁹ CEPIS estimated that a city with 500.000 to 1.000.000 inhabitants would require between five to eight monitoring stations to get a general view of the air pollution's extent. Furthermore, PAHO and later CEPIS worked on a detailed manual to ensure that all members used the same monitoring equipment to compare results.⁴⁰ Haddad and members of his *Asesoría*, which in 1968/1969 became integrated in the newly founded Pan American Center for Sanitary Engineering and Environmental Sciences (CEPIS) in Lima, also negotiated with national and regional governments of those cities concerned. CEPIS, which had been founded by PAHO in 1968, took over the responsibility for the REDPANAIRE and its coordination the following year.⁴¹ From its seat in the Peruvian capital Lima, CEPIS offered scientific and technical assistance in the field of environmental issues. Subsequently, it also conducted research and pro-

37 CEPIS, Annual Report 1970, p. 7; R. Haddad, Contaminación del Aire, in: Centro de Educación Continua de la Facultad de Ingeniería de la Universidad Autónoma de México (ed.), Control de la Contaminación Atmosférica, Mexico D.F. 1971, p. 19; CEPIS, Informe Anual 1969, pp. 9 and p. 11.

38 Alvarez, Pan American Air Monitoring Network, pp. 95–97; Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente, 30 años CEPIS 1968–1998. Frente a los Retos de un Nuevo Siglo, Lima 1998, p. 9; CEPIS, Informe Anual 1969, p. 2 and pp. 9–10; CEPIS, Informe Anual 1972, p. 20; CEPIS/OPS/OMS, Informe Final, p. 5 and p. 11; CEPIS/OPS/OMS, Manual de Operaciones, p. 2; CEPIS/OPS/OMS, Resultados 1967–1970, pp. 3–4; Haddad/Bloomfield, Contaminación, p. 249; Korc/Sáenz, Monitoreo, p. 2.

39 Alvarez, Pan American Air Monitoring Network, p. 96; CEPIS, Informe Anual 1969, pp. 9–10; CEPIS/OPS/OMS, Informe 1967–1974, p. 5; CEPIS/OPS/OMS, Resultados 1967–1970, pp. 3–6. – CEPIS/OPS/OMS, Manual de Operaciones, p. 2 and CEPIS/OPS/OMS, Resultados 1967–1970, pp. 134–146. list up all equipment required for one station and additional ones.

40 CEPIS/OPS/OMS, Informe Final, pp. 5–9 and p. 14; CEPIS/OPS/OMS, Manual de Operaciones, p. 3; CEPIS/OPS/OMS, Resultados 1967–1970, pp. 3–5; Haddad, Contaminación del Aire. Situación Actual, p. 2; Márquez Mayaudón, Información, p. 501.

41 Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente, Informe Anual 1975, Lima 1976, p. 5; Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente, Informe Anual 1976, Lima 1977, p. 9; CEPIS, Informe Anual 1969, p. 2 and 24; CEPIS, Informe Anual 1974, p. 1; CEPIS/OPS/OMS, Informe Final, p. 5; CEPIS/OPS/OMS, Manual de Operaciones, p. 1; CEPIS/OPS/OMS, Resultados 1967–1970, p. 5.

vided training programmes. This was very important as qualified personnel were scarce throughout the region.⁴² Furthermore, CEPIS disseminated information through its publications and cooperated with other actors ranging from members of the United Nations family to local public utilities companies. It thereby contributed to achieving one of the aims of the REDPANAIRE: to create awareness.⁴³ Information included advice on how participating countries could create the infrastructure necessary to perform efficient prevention and control measures, emphasizing that prevention was better and more cost-effective than corrective measures.⁴⁴

Beginning in April 1967, the first REDPANAIRE monitoring stations were installed with the help of PAHO's staff.⁴⁵ Those stations monitored pollution that occurred in a 1 km radius, in some cases they even covered up to 5 km and initially monitored three main contaminants: settled dust, suspended dust and sulfur dioxide.⁴⁶ The methods employed for measuring were originally developed in England and used throughout Europe and parts of the US. While samples to monitor suspended dust and sulfur dioxide were taken daily, settled dust was measured once a month. However, pollutants originating from motor vehicles were not included, since measuring them was technically and financially not feasible.⁴⁷

The first station in Santiago de Chile started its operation in June 1967, followed by the Brazilian cities Rio de Janeiro and São Paulo in July. Buenos Aires (Argentina), Lima (Peru), and Mexico City (Mexico) put their first stations into operation in August and Bogotá (Colombia) in November 1967. Jamaica, another founding member of the regional network, installed its first station in January 1968.⁴⁸ It was planned to extend the network and install stations in industrial and residential areas to get a better grasp of the pollution's extent.⁴⁹ It is important to mention that the local and national authorities were responsible for the operation of the REDPANAIRE monitoring stations as well as for the quality of the results. CEPIS' task was to coordinate the REDPANAIRE, provide technical assistance and "collect, analyze, process and disseminate the results".⁵⁰

42 CEPIS, Informe Anual 1971, Lima 1972, p. 1; CEPIS, Informe Anual 1973, Lima 1974, p. 10; CEPIS, Informe Anual 1977, Lima 1978, p. 14; CEPIS, Informe Anual 1969, pp. 2–3 and p. 9; CEPIS, Informe Anual 1972, p. 1; CEPIS, Informe Anual 1974, p. 1 and p. 4; CEPIS, Informe Anual 1975, p. 5; CEPIS, Informe Anual 1976, pp. 5 and p. 30; CEPIS/OPS/OMS, Informe Final, p. 14 and CEPIS/OPS/OMS, Resultados 1967–1970, p. 2.

43 CEPIS, Informe Anual 1969, p. 2; CEPIS, Informe Anual 1971, p. 1 and p. 7; CEPIS, Informe Anual 1973, p. 10; CEPIS, Informe Anual 1974, p. 1; CEPIS, Informe Anual 1975, p. 5; CEPIS, Informe Anual 1976, p. 5 and CEPIS, Informe Anual 1977, p. 14.

44 CEPIS/OPS/OMS, Resultados 1967–1970, pp. 4–5.

45 Ibid., p. 5.

46 CEPIS, Informe Anual 1969, p. 7 and CEPIS/OPS/OMS, Manual de Operaciones, p. 2.

47 CEPIS/OPS/OMS, Equipo y Materiales, p. 1; CEPIS/OPS/OMS, Informe 1967–1974, p. 4; CEPIS/OPS/OMS, Manual de Operaciones and CEPIS/OPS/OMS, Resultados 1967–1970, pp. 1–5.

48 CEPIS, Informe Anual 1969, pp. 9–11. and p. 24; CEPIS, Informe Anual 1971, p. 11 and p. 19; CEPIS/OPS/OMS, Informe final, p. 9; CEPIS/OPS/OMS, Resultados 1967–1970, p. 5; CEPIS/OPS/OMS, Results 1967–1973, p. 1.

49 CEPIS/OPS/OMS, Informe 1967–1974, p. 4 and p.49; CEPIS/OPS/OMS, Resultados 1967–1970, p. 7.

50 Alvarez, Pan American Air Monitoring Network, p. 95. See also: CEPIS/OPS/OMS, Informe 1967–1974, pp. 1–3; CEPIS/OPS/OMS, Informe Final, p. VII and pp. 13–14; CEPIS/OPS/OMS, Resultados 1967–1970, p. 5.

CEPIS had an agreement with the *Universidad Nacional de Ingeniería de Lima* (National University of Engineering in Lima) and used computers and programmes in their computer centre. Based on data obtained from REDPANAIRE's members, CEPIS periodically published reports which informed its member states about recent advances of the monitoring network and the state of air quality. The reports were published in Spanish – the first language of the vast majority of participants – and English. The latter enabled other non-members such as India, England, Iran and even Syria, to request copies and get insights into the monitoring activities in Latin America and the Caribbean.⁵¹ Beyond that, and based on the information published in its reports, CEPIS strove to improve the REDPANAIRE. Of great value in this regard was the *Comité Asesor en Contaminación Atmosférica*, a kind of advisory panel that evaluated the work of the REDPANAIRE and gave recommendations on the future of the network. The panel comprised experts from international organizations, the manager responsible for the REDPANAIRE, Ricardo Haddad, and representatives of participating countries, such as Mexico, which sent Enrique Márquez Mayaudón, a member of its environmental authority who was also engaged into local REDPANAIRE activities.⁵²

3. Mexico City's Involvement in the REDPANAIRE

Given the magnitude of Mexico City's air pollution problems and the political will at local and national levels to address those air pollution problems, REDPANAIRE seemed to be a particularly suitable programme for the city to get a deeper insight into the extent of its air pollution and take further steps to enhance urban air quality.⁵³ Local administrations and researchers therefore actively pushed for its inclusion within the REDPANAIRE, making it a founding member of the network.⁵⁴

The authority responsible for collecting and evaluating the samples of the 14 monitoring stations was initially with the DHI.⁵⁵ Between 1967 and 1974, Mexico City collected

51 CEPIS, Informe Anual 1969, p. 19; CEPIS, Informe Anual 1971, p. 5 and p. 19; CEPIS, Informe Anual 1972, p. 24; CEPIS, Informe Anual 1973, p. 64; CEPIS, Informe Anual 1974, p. 5; CEPIS/OPS/OMS, Equipo y Materiales, p. 1 and CEPIS/OPS/OMS, Informe Final, p. VII.

52 CEPIS, Informe Anual 1974, pp. 4–5. – Márquez Mayaudón documented throughout the 1970s the current state of urban air pollution and related control activities in Mexico City. For his publications see note 5.

53 Alvarez, Pan American Air Monitoring Network, p. 95; CEPIS, Informe Anual 1969, pp. 9–10, CEPIS, Informe Anual 1973, p. 11; CEPIS/OPS/OMS, Informe Final, p. 5 and p. 11; CEPIS/OPS/OMS, Resultados 1967–1970, pp. 4–6; Haddad and Bloomfield, Contaminación, p. 249.

54 Further information on the stations provide: Dirección de Higiene Industrial, Medición de la Contaminación Atmosférica, in: Salud Pública de México. Epoca V. Volumen XI Número 5 Septiembre–Octubre (1969), pp. 669–671; L. E. Ehrlich, Administración del Recurso Aire en México, in: Organización Panamericana de la Salud / Organización Mundial de la Salud / Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente: Simposio sobre Ambiente, Salud y Desarrollo en las Américas. México, D.F. 29. de Julio al 2 de Agosto de 1974, Lima 1976, p. 224; López de Alba, Políticas y Estrategias, p. 31 and p. 42, Márquez Mayaudón, Actividades, p. 418; Márquez Mayaudón, Estado Actual, pp. 100–101; Márquez Mayaudón, Evaluación, p. 629.

55 The CEPIS report CEPIS/OPS/OMS, Resultados 1967–1970, p. 7 mentions the Sub-Secretaría de Salubridad, this was probably a typo because the Mexican Preparation Committee for the UNCHE and Mexican researcher Hum-

44,290 samples, which were roughly 30 per cent of REDPANAIRE's total samples by that time. Nearly half of Mexico City's samples far surpassed suggested reference levels.⁵⁶ Mexican researchers also stressed that the measured values even surpassed those of London or some US-American cities suffering from air pollution to illustrate the extent of Mexico City's miserable situation⁵⁷. However, London and US cities had, by that time, more elaborate technical measures and laws which started to bear fruit, while Mexico City had not taken any measures at all to improve its urban air quality.

During its REDPANAIRE membership, Mexico City constantly strove to improve its air pollution monitoring, taking the results obtained as a basis for further measures. In doing so, it counted on CEPIS, which in turn cooperated with local authorities and the UNAM. Examples of the latter would be several training courses such as the *Curso sobre Contaminación del Aire* which took place at the end of 1971.⁵⁸ Contrary to other founding members of the REDPANAIRE, which just started with one single monitoring station, Mexico City purchased additional stations and soon had four stations in the first months of its operation.⁵⁹ Thus, Mexico City was able to cover different zones of the urban area – such as residential areas and industrial zones – and draw conclusions on the influence of disruptive factors on the air quality.

Based on the results obtained from the REDPANAIRE that indicated a significant degree of pollution, Mexico started to introduce a number of new pieces of legislation in the early 1970s, among them a federal law, the *Ley Federal para Prevenir y Controlar la Contaminación del Ambiente*, which was passed in March 1971.⁶⁰ This date is often considered as starting point for Mexico's environmental policy.⁶¹ CEPIS considered the law to be a perfect example of legislation for other countries, which is unsurprising as it had supported the Mexican government in drafting the law.⁶² Apart from arranging responsibilities and introducing the first measures to prevent and control pollution, the law provided a definition for contaminants and pollution.⁶³ The law was complemented

berto Bravo speak of the Secretaría de Salubridad y Asistencia. See Comisión Preparatoria, Informe nacional, p.5 and Bravo Alvarez, La Contaminación, p. 17. In 1970, the DHI was renamed to DHA, short for Dirección de Higiene del Ambiente. In 1972 the newly founded Subsecretaría de Mejoramiento del Ambiente (SSMA), the national environment authority, took over the responsibility for air pollution control efforts. See Presidencia de la República de los Estados Unidos Mexicanos, Acuerdo por el que se crea en la Secretaría de Salubridad y Asistencia la Subsecretaría de Mejoramiento del Ambiente, in: Salud Pública de México. Época V. Volumen XIV. Número 2 Marzo–Abril de 1972, p. 281; M. A. Gil Corrales, Crónica del Instituto Nacional de Ecología, México, D.F. 2009; Salud Pública de México, Nueva Denominación de la Dirección de Higiene Industrial, in: Salud Pública de México XII (1970) 4, pp. 567–567.

56 CEPIS/OPS/OMS, Informe 1967–1974, p. 10, pp. 32–33; CEPIS/OPS/OMS, Informe Final, p. 20–26, p. 33 and p. 42.

57 Bravo Alvarez, La Contaminación, p. 17; Comisión Preparatoria, Informe nacional, p. 31 and Jáuregui Ostos, Meteorología y el Ambiente Urbano, p. 24.

58 CEPIS, Informe Anual 1971, pp. 16–21; CEPIS, Informe Anual 1972, p. 21.

59 Haddad, Contaminación del Aire. Situación Actual, p. 5.

60 The *Ley Federal Para Prevenir y Controlar La contaminación Ambiental* is attached to Comisión Preparatoria, Informe nacional.

61 Bravo Alvarez, La Contaminación, p. 221; Secretaría de Salubridad y Asistencia, Situación, p. 61.

62 CEPIS, Informe Anual 1971, p. 11 and p. 19; CEPIS/OPS/OMS, Informe 1967–1974, p. 34; CEPIS/OPS/OMS, Resultados 1967–1970, p. 3.

63 Comisión Preparatoria, Informe Nacional, pp. 18–19.

through a regulation, the *Reglamento para la Prevención y Control de la Contaminación Atmosférica producida por la Emisión de Humos y Polvos* on 11 September 1971. The regulation was criticized because it did not differentiate between certain types of industrial combustion processes and therefore lacked specificity. However, the regulation included specific pollution control activities aimed at reducing air pollution caused by industry and imposed severe fines for infringements.⁶⁴ In the same year, the federal government of Mexico also required new cars to be built with a crankcase ventilation system in the hopes of enhancing the air quality – this undertaking was not successful because the price-performance ratio was not satisfactory.⁶⁵ Additionally, in January 1972 the Mexican president established the *Subsecretaría de Mejoramiento del Ambiente* (SSMA) as a branch of the federal *Secretaría de Salubridad y Asistencia* (SSA). One of its purposes was to support the SSA in the field of environmental pollution prevention and control and to promote measures to reduce pollution originating from industrial sources.⁶⁶ This was a difficult endeavour, as the interests of state actors, urban population, industry and business conflicted, and the question of power arose.

In relation to other Latin American outfits, the SSMA had a considerable amount of staff from different academic disciplines and sufficient funds to work on the implementation of evaluation, prevention and control mechanisms. However, at the end of the 1970s, the SSA was still convinced that it was underfunded.⁶⁷ The weak points of the SSMA were in technological aspects and the qualification of personnel. In this regard, it received support from PAHO and CEPIS. In particular, CEPIS cooperated in its technical assistance programmes with local actors, such as the UNAM University. For instance, in 1971 they offered a course on air pollution control to qualify the much needed local personnel.⁶⁸

At the end of 1972, the Mexican government also created the *Departamento de Monitoreo* to cope with the main problem of the REDPANAIRES – the lack of reliability. One of its first actions was the investigation of the validity of measurement procedures since the data obtained from the REDPANAIRES were technically deficient and not suitable to serve as a base for taking far-reaching decisions. Mexican authorities underlined that a major problem of the REDPANAIRES was that equipment and methodology were taken from Europe without adjusting them to local needs. Therefore, they were convinced that the methodology was not appropriate for Mexico City. As a first step, in 1972 Mexico

64 See Bravo Alvarez, *La Contaminación*, p. 222; López de Alba, *Políticas y Estrategias*, p. 30; *Reglamento para la Prevención y Control de la Contaminación Atmosférica originada por la Emisión de Humos y Polvos*, in: *Salud Pública de México* XII, no. 5 (1971), pp. 873–883; Secretaría de Salubridad y Asistencia, *Situación*, p. 61.

65 Bravo Alvarez, *La Contaminación*, p. 17.

66 Ibid., pp. 221–222; Presidencia de la República de los Estados Unidos Mexicanos, *Acuerdo*, pp. 281–282; Ehrlich, *Administración* p. 221; Gil Corrales, *Crónica*; López de Alba, *Políticas y Estrategias*, p. 30; Presidencia de la República de los Estados Unidos Mexicanos, *Acuerdo*, pp. 281–282; Secretaría de Salubridad y Asistencia, *Situación*, p. 61.

67 CEPIS/OPS/OMS, *Informe 1967–1974*, p. 49; Secretaría de Salubridad y Asistencia, *Situación*, p. 61.

68 Interestingly, a manual with nearly 700 pages is still available and provides information on participants, lecturers and contents of the two-week course. See Centro de Educación Continua de la Facultad de Ingeniería de la Universidad Autónoma de México, *Control de la Contaminación Atmosférica*, Mexico D.F. 1971.

City decided to base the operation of its 14 REDPANAIRES stations on the methodology developed by the US-American Environmental Protection Agency (EPA) because it thought it would be more reliable.⁶⁹

However, since the change of methodology did not lead to the significant improvement Mexico City hoped for, local authorities decided to substitute their 14 manual REDPANAIRES monitoring stations with an automatic computer-based network which would provide more valid data. Obviously, the Mexicans were aware that such an endeavor would require financial and personal resources beyond their means. Therefore, they decided to apply for development aid. CEPIS and PAHO supported Mexico City and the federal government to file an application for a comprehensive environmental project to the United Nations Development Programme (UNDP) by sending a short-term consultant that evaluated the air pollution-related questions. The consultant was probably Ricardo Haddad. The centrepiece of the project was a computerized automatic monitoring system.⁷⁰

After minor adjustments, the UNDP agreed to support Mexico's endeavour. The new system, officially known as *Red Computarizada Automática de Monitoreo Atmosférico del Valle de México* but shortened in daily life to *Red Philips* because of the manufacturer of the monitoring system, was – by that time – the most expensive and elaborate in Latin America.⁷¹ The UNDP also provided international experts in the field of air pollution, supported courses to train personnel that operated the monitoring stations and allocated scholarships allowing Mexican graduates to pursue masters and PhD degrees abroad that would allow them to take over future leading positions in the field of air pollution control. Furthermore, resources of the UNDP project were used to create an inventory of pollution sources. The project also comprised monitoring stations for other Mexican cities affected by air pollution, namely Monterrey and Guadalajara.⁷² Throughout the project, CEPIS supported the Mexican authorities.⁷³ Thus, the monitoring stations of the *Red Philips* were spread all over Mexico City and some industrial areas in the north of the city.⁷⁴

With the *Red Philips*, which was able to monitor additional contaminants, Mexico City hoped to obtain more exact measurement results. Contrary to the REDPANAIRES, the *Red Philips* had at least an internal calibration. Moreover, it used measurement methods

69 Bravo Alvarez, *La Contaminación*, p. 17; CEPIS, *Informe Anual 1972*, p. 28; CEPIS, *Informe Anual 1976*, p. 9; López de Alba, *Políticas y Estrategias*, pp. 31–33 and p. 42.

70 Bravo/Magaña/Magaña, *Air Pollution Situation*, pp. 427–428; CEPIS, *Informe Anual 1972*, pp. 21–28; CEPIS, *Informe Anual 1973*, p. 78; CEPIS, *Informe Anual 1974*, p. 5; CEPIS/OPS/OMS, *Informe 1967–1974*, p. 34; CEPIS/OPS/OMS, *Informe Final*, p. 33; CEPIS/OPS/OMS, *Resultados 1967–1970*, p. 2; Haddad, *Contaminación del Aire. Situación Actual*, p. 6.

71 Philips, *Air-monitoring networks – a growing market*, in: *Environmental Protection News* No.2 (1977), pp. 7: “the total cost amounts to USD 1,5 millions” and Philips, *Mexico City Air-Monitoring Network goes on-line*, in: *Environmental Protection News* No.3 (1976), pp. 1–2.

72 Bravo Alvarez, *La Contaminación*, p. 11; Haddad, *Contaminación del Aire. Situación Actual*, p. 8 and López de Alba, *Políticas y Estrategias*, p. 9 and p. 36.

73 CEPIS, *Informe Anual 1972*, pp. 25–29; CEPIS, *Informe Anual 1973*, p. 78; CEPIS, *Informe Anual 1974*, p. 5.

74 López de Alba, *Políticas y Estrategias*, p. 42.

that were certified by the EPA and allowed international comparisons of results.⁷⁵ As a result of its efforts to set up the *Red Philips*, Mexico City canceled its participation in the REDPANAIRE. This underlines the fact that Mexico City was ahead of the times. During the 1970s, it became clear that there would be an international monitoring network, the GEMS (Global Environmental Monitoring System), and that sooner or later, most Latin American and Caribbean states would have to convert their manual monitoring stations to automatic ones.⁷⁶

However, since neither the manual monitoring stations of the REDPANAIRE nor the automatic stations of the *Red Philips* had sufficient calibration mechanisms, the system did not deliver the results the Mexican authorities had hoped for.⁷⁷ Furthermore, the transmission of the measurements via telephone was often interrupted or deficient. Therefore, the *Red Philips*, which comprised 20 fixed and two mobile monitoring stations in the Mexican Valley, stopped operating in the second half of the 1970s.⁷⁸ Certainly, the technical deficiencies were not the only reason for stopping the monitoring of pollutants. The changing political situation, too, played an important role: While during the presidency of Echeverría (1970–1976), environmental issues were relatively important, the administration of President José López Portillo (1976–1982) did not pay much attention to pollution problems. Either the post-Stockholm euphoria ebbed away, or it was the fact that Mexico struggled with a severe economic crisis which required the full attention of the political leaders. Most of the environmental policy measures undertaken by López Portillo failed: Between 1976 and 1982 the *Red Philips* was de facto out of order.

4. Conclusion

After 13 years of operation and having expanded the network from eight stations in eight cities in 1967 to 153 monitoring stations in 48 cities in 1980, as documented in table 1, the REDPANAIRE ceased its activities in 1980 with the publication of the its final report, the *Informe Final*.

The surrounding political troubles notwithstanding, the monitoring network had completed its mission. It had contributed to a better understanding of the real magnitude of the air pollution problem in the major cities of the Americas by collecting data on the extent of air pollution and raising awareness for the air pollution complex.⁷⁹ Following the end of REDPANAIRE in 1980, some of the existing stations were integrated into a

75 The *Red Philips* was also able to monitor nitrogen oxides, carbon monoxide and ozone, See López de Alba, *Políticas y Estrategias*, pp. 32–33 and 42.

76 CEPIS, *Informe Anual 1976*, p. 10; CEPIS, *Informe Anual 1978*, Lima 1979, p. 15; CEPIS, *Informe Anual 1979*, Lima 1980, p. 16; CEPIS/OPS/OMS, *Informe Final*, p. 38.

77 López de Alba, *Políticas y Estrategias*, p. 31.

78 Bravo/Torres, *Situación Actual*, p. 119; Bravo Alvarez, *La Contaminación*, p. 17; López de Alba, *Políticas y Estrategias*, pp. 32–34; Márquez Mayaudón, *Información*, p. 502.

79 CEPIS/OPS/OMS, *Informe Final*, pp. 11–12 and p. 38.

world-wide monitoring network called GEMS, which was established in the 1970s by the WHO and the United Nations Environment Programme (UNEP) with support of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the World Meteorological Organization (WMO). Since 1978, CEPIS and PAHO closely cooperated with GEMS and supported the implementation of monitoring stations that were compatible with the new monitoring system. It furthermore disseminated information and collected the samples from the already upgraded monitoring stations.⁸⁰ While the Mexico City's overall air quality did not improve significantly between the late 1950s and early 1980s, participation within the REDPANAIRE did offer the city an excellent opportunity to internationalize its fight against urban air pollution. The REDPANAIRE encouraged Mexico (City) to network within the global governance framework, allowed Mexico City to benefit from development aid and technical assistance, and helped create (global) awareness. Last but not least, taking part in the REDPANAIRE helped Mexico (City) to solidify its urban development policy in the field of the environment, raising awareness for an extreme dimension of air pollution that outstripped the problems of other Latin American and Caribbean states.

80 For further information on the GEMS see CEPIS, Informe Anual 1979, p. 16; CEPIS, Informe Anual 1975, p. 8; CEPIS, Informe Anual 1976, p. 10; CEPIS, Informe Anual 1977, p. 15; CEPIS, Informe Anual 1978, p. 15; CEPIS/OPS/OMS, Informe Final, p. 38; H. W. De Koning, Global Air Quality Monitoring, in: T. Schneider / H. W. De Koning / L. J. Brasser (eds.), Air Pollution Reference Measurement Methods and Systems. Proceedings of the International Workshop, Bilthoven, December 12–16, 1977, Amsterdam 1978, pp. 127–132; Korc / Sáenz, Monitoreo, p. 3.

Table 1: Development of the REDPANAIRE⁸¹

year	no. of stations	no. of participating cities	no. of participating countries	no. of stations in Mexico City
1967	8	7	6	4
1968	15	9	8	7
1969	22		8	9
1970	29	14	10	11
1971	52	23	13	11
1972	62	24	13	14
1973	88	26	14	14
1974	93	30	14	14
1975	93	30	15	
1976	120	30	15	
1977	120	40	16	
1978	120	30	15	
1979	118	48	19	
1980	153	48	18	

81 The number of stations quoted in the publications often differ from each other. Probably they are referring to different months of the respective year. Following publications provide information on the development of the transnational monitoring network: Alvarez, Pan American Air Monitoring Network, p. 95; CEPIS, Informe Anual 1969, p. 11; CEPIS, Annual Report 1970, p. 7; CEPIS, Informe Anual 1971, p. 5 and p. 11; CEPIS, Informe Anual 1972, pp. 17–18; CEPIS, Informe Anual 1973, pp. 10–12; CEPIS, Informe Anual 1974, p. 4; CEPIS, Informe Anual 1976, p. 46; CEPIS, Informe Anual 1977, p. 8 and 14; CEPIS/OPS/OMS, Informe 1967–1974, p. 1; CEPIS/OPS/OMS, Informe Final, p. 9, p. 16, and p. 42; CEPIS/OPS/OMS, Equipo y Materiales, p. 1; CEPIS/OPS/OMS, Results 1967–1973, p. 1; R. Haddad, Contaminación del Aire, in: Centro de Educación Continua de la Facultad de Ingeniería de la Universidad Autónoma de México (ed.), Control de la contaminación atmosférica, Mexico D. F. 1971, S. 1–31, p. 20; Haddad, Contaminación del Aire. Situación Actual, p. 2; R. Haddad/C. R. Bartone/A. Velazco, Situación de la contaminación del aire en los países bolivarianos. Resultados consolidados REDPANAIRE 1967–1980, in: Asociación Venezolana de Ingeniería Sanitaria y Ambiental. Sección Venezolana de AIDIS (ed.), Criterios de calidad ambiental. I Congreso Bolivariano y III Congreso Venezolano de Ingeniería Sanitaria y Ambiental. Agosto 28 Septiembre 2/1983. Tema IV: Residuos Líquidos, Sólidos y gaseosos, Caracas 1983, s.p and p. 6; López de Alba, Políticas y Estrategias, p. 31.