

Metro planners steer different courses

In this analysis, Chris Jackson identifies over 150 cities around the world where metro projects totalling almost 6 000 route-km are actively being pursued

AT THE START OF 1986, over 1 000 km of new metro line is under construction, and no less than 159 cities are actively engaged in planning or building metros.

The total length of lines planned is 5 946 km, and apart from the 1 053 km already under construction, a further 1 770 km has reached the design stage.

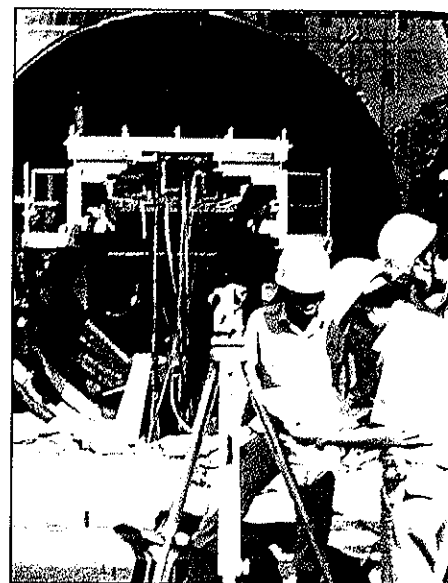
Within the overall pattern of growth, regional trends are clearly apparent (Fig 1). In the capital-conscious cities of Europe and North America, emphasis is being placed on the need to match the anticipated traffic levels with a cost-effective design so as to minimise the construction cost for each passenger place.

Low cost options are gaining importance, and good system design becomes vital.

Light metros based on conventional LRT technology and the nascent fully automated mini-metro are becoming increasingly important, but the large numbers of existing networks tied to traditional heavy metro standards means that most extension projects will continue to use this technology.

Extensions to existing systems account for almost two-thirds of the route length currently under construction. Of the 83 cities with operating metros listed in Table I, no less than 71 have extension work in hand.

Major extension programmes are under way in Tokyo, where a 150 km expansion is plan-



ned, and Wien, where two new lines are under construction. New lines are being added to existing networks in Bucharesti, Caracas, Kharkov, Mexico City and Sendai, while existing lines are being lengthened in many cities including Baltimore, Budapest, Montreal, Praha and Roma.

Mini-metro feeders connecting development areas with an existing system are being built in London's Docklands, Fukuoka and Yokohama, while a second VAL line is under construction in Lille. The downtown people-mover in Miami will act as a city centre distributor and can be considered as a mini-metro.

The 345 km of completely new lines being built are divided between 22 cities, as shown in Table II. Largest single project under construction is the 67 km network in Singapore, on which work is well advanced for opening in 1988. Ground-breaking ceremonies for Los Angeles' 34 km light rail line to Long Beach were held on October 31, following the start of work in San Jose. Portland's 24 km first line is due to open in August, with Sacramento following close behind. New heavy metros are also under construction in Alma Ata, Dnepropetrovsk, Kuibishev, Sverdlovsk and Ufa in the USSR.

Planning trends

Projects still in the detailed design stage are evenly divided between further extensions and new networks, but regional variations become more evident where cities are looking to metros for the first time. The 815 km of new network in design includes over 400 km of light metro in North America and Western Europe, with North America's light rail revival almost eliminating the heavy metro.

The success of VAL in Lille has prompted several cities to choose the automated mini-metro, but the USSR remains firmly wedded to the heavier standards of the traditional metro. New networks are being designed for 15 cities, but the planned Soviet standard light metro is still on the Metrogiprottrans drawing board in Moscow.

South American cities, too, are firmly in favour of the heavy metro, although Buenos

Table I. Cities with existing metros which are planning or building extensions

City	Building km	Design km	Proposed km	City	Building km	Design km	Proposed km
Amsterdam	-	16	-	Miami	3	-	-
Antwerpen	7	6	-	Milano	15	9	-
Athens	1	-	27	Minsk	9	7	61
Atlanta	7	9	-	Montreal	13	43	-
Baku	4	9	11	Moscow	8	22	133
Baltimore	10	-	22	München	17	22	-
Barcelona	9	21	-	Nagoya	5	-	-
Beijing	-	10	13	Newcastle	-	10	15
Belo Horizonte	44	-	-	Novosibirsk	4	-	37
Berlin	3	-	-	Nürnberg	3	24	-
Brussels	4	-	-	Osaka	8	23	-
Bucharesti	19	-	-	Oslo	2	-	-
Budapest	12	-	-	Paris	1	11	-
Buenos Aires	8	5	-	Pittsburg	-	-	6
Calcutta	11	18	25	Porto Alegre	17	-	-
Calgary	6	-	32	Praha	10	-	-
Caracas	21	5	15	Pusan	9	77	-
Charleroi	-	31	-	Recife	12	-	-
Chicago	1	15	-	Rio de Janeiro	-	-	118
Edmonton	3	22	-	Roma	11	7	-
Frankfurt	9	7	-	Rotterdam	2	-	-
Fukuoka	2	-	-	San Diego	7	21	123
Gorky	2	9	27	San Francisco	-	57	38
Hamburg	3	5	-	Santiago	2	12	-
Hannover	7	4	-	Sao Paulo	6	8	16
Helsinki	3	-	-	Sapporo	9	11	-
Hong Kong	25	15	-	Sendai	14	-	-
Kharkov	24	3	14	Seoul	-	-	110
Kiev	11	24	-	Tashkent	9	13	27
Kobe	10	-	-	Tbilisi	8	21	25
Krivoy Rog	4	13	12	Tianjin	-	7	-
Kyoto	4	-	-	Tokyo	51	59	41
Lausanne	-	8	-	Torino	6	18	31
Leningrad	14	46	-	Toronto	-	20	20
Lille	12	16	16	Tunis	20	-	-
Lisbon	8	26	-	Valencia (Spain)	8	-	-
London	18	9	-	Vancouver	7	6	-
Lyon	9	-	-	Washington	15	32	-
Madrid	4	-	-	Wien	25	-	-
Manila	-	-	22	Yerevan	5	35	-
Marseille	5	-	-	Yokohama	2	13	-
Mexico City	21	15	21	Totals	708	955	1 600

RIGHT: Fig 1. Heavy metro construction still dominates the world scene, but lighter options are becoming increasingly important in Europe and North America

LEFT: Construction of the world's largest new metro network is well advanced in Singapore, open in 1988

Aires is experimenting with LRT. Several cities, mainly in Brazil, are converting existing suburban railways into independent heavy metros, whilst Santiago and Mexico City continue to develop their French-inspired rubber-tyred networks. However, Montreal is planning to move away from rubber tyres, and Algiers has modified its specifications to allow steel wheel/steel rail tenders for what was originally a rubber-tyred network.

In the Far East, planners are evenly split between light and heavy metros, with Singapore and Taipei opting for the traditional system while Bangkok and Kuala Lumpur follow Manila down the light rail trail. In Japan both heavy and light metros are being expanded, and the mini-metro is emerging both as a feeder and as an independent network. Australia's sole project is the 6 km Darling Harbour monorail scheme in Sydney.

Africa's only operational metro is the four-line light rail network now nearing completion in Tunis. Despite this success the light metro has made few inroads into a continent where the heavy metro is preferred to cope with huge volumes of traffic, for example in Cairo (p104). Design contracts for a 70 km network in Tripoli were awarded early in 1984, but the decision to opt for a heavy metro was probably influenced by prestige considerations as the population is insufficient to justify such a system; construction is not expected to start before 1987. A feasibility study for a 17 km line in Alexandria was submitted in July 1985.

Major networks have been proposed for several Middle-Eastern cities such as Tehran and Baghdad, but in most cases work has not progressed to the design stage. Again, the light metro option seems set to bring more rapid results, with design work pushing ahead in both Ankara and Istanbul.

Into the future

Although the well-established networks in Europe and North America will continue to dominate the world scene for many years, the emergence of new metros in the growing cities of the developing countries will start to swing the geographical balance.

The comparative ease with which light metro projects can be brought to fruition will ensure that the mode continues to make inroads into the metro market, and the automated mini-metro is poised to become the growth area of the 1990s.

Cost-effective construction and reduced operating costs are likely to dominate thinking in the developed countries for the foreseeable future, and — with many development agencies now adopting the same approach — value for money will also become the watchword in the cities of the developing world. □

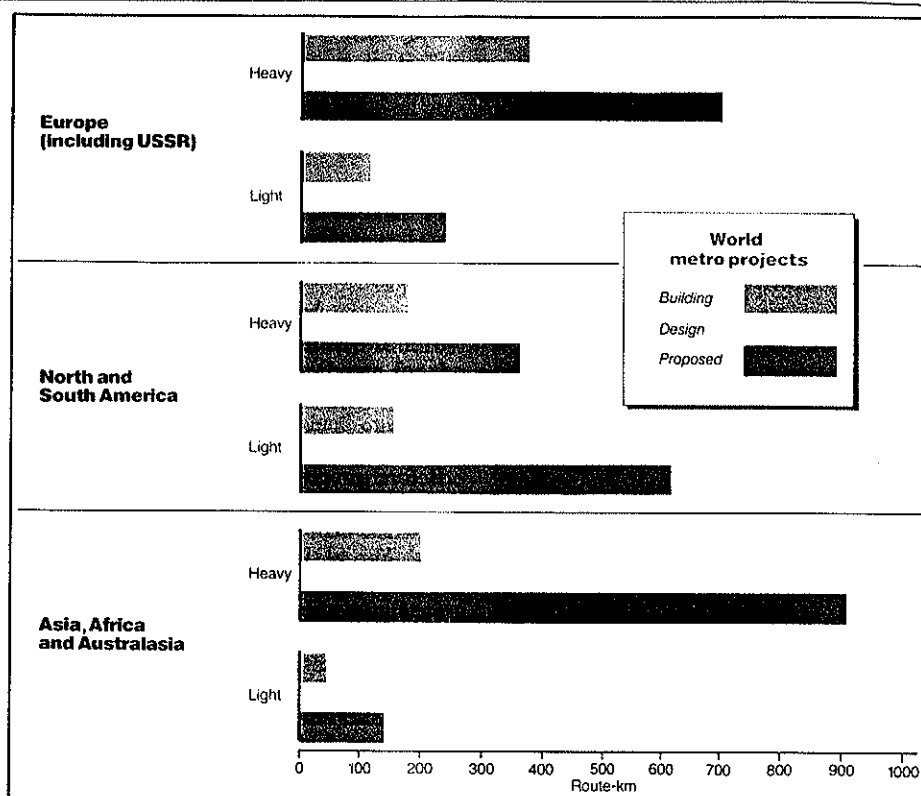


Table II. Cities without an existing metro or light rail service which have new networks under construction, in design, or proposed

City	Building km	Design km	Proposed km	City	Building km	Design km	Proposed km
Abidjan	-	-	18	Lodz	-	-	21
Alexandria	-	-	18	Los Angeles	34	27	22
Algiers	-	12	53	Lviv	-	-	12
Alma Ata	8	32	-	Madras	-	-	22
Ankara	-	7	16	Manchester	-	31	56
Baghdad	-	32	-	Medellin	27	-	-
Bangkok	-	34	26	Napoli	17	24	-
Bilbao	-	29	20	Norfolk	-	-	32
Birmingham	-	-	20	Odessa	-	11	24
Bogota	-	-	24	Oklahoma	-	-	28
Bologna	-	-	14	Omsk	-	7	17
Bombay	-	-	30	Orlando	-	12	38
Bratislava	-	-	10	Perm	-	-	9
Bursa	-	-	20	Portland	24	-	19
Cairo	5	23	-	Riga	9	10	21
Chelyabinsk	-	7	-	Rostov on Don	-	11	8
Curitiba	-	-	19	Sacramento	30	-	-
Dallas	-	111	124	San Jose	32	10	-
Damascus	-	-	113	Seattle	-	-	97
Detroit	5	-	24	Shanghai	-	14	132
Donetsk	-	12	-	Sheffield	-	-	25
Dnepropetrovsk	12	10	74	Singapore	67	-	20
Genova	8	14	-	Sofia	3	45	18
Grenoble	9	4	-	St Louis	-	-	28
Guangzhou	-	-	21	St Petersburg	-	-	37
Habana	-	23	-	Strasbourg	-	15	-
Hiroshima	-	-	12	Sverdlovsk	-	-	28
Houston	-	122	-	Sydney	-	6	-
Istanbul	-	7	18	Taipei	-	34	38
Jacksonville	-	-	11	Tehran	-	-	16
Karachi	-	-	20	Tel Aviv	-	-	30
Kazan	-	-	24	Toulouse	-	9	5
København	-	17	-	Tripoli	-	-	76
Krasnoyarsk	-	-	14	Ufa	-	-	-
Kuala Lumpur	-	19	17	Valencia (Venez)	-	-	10
Kuibishev	-	6	14	Warsaw	-	12	11
Lagos	-	-	21	Zürich	-	-	-
Liège	-	16	-				
Lima	-	-	32				
				Totals	315	815	1038